













# Pantologia

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# PANTOLOGIA.

## A

**A** IS the first letter of the alphabet in every known language, except that of Ethiopia, its Greek name is *Alpha* from the Hebrew *Alaph*, which is very significant, denoting either an *or* or a *leader*, (with a mark of excellence or priority). The first place is deservedly given to this letter on account of its simplicity, and the ease with which it is pronounced, the first sound uttered by human creatures in their most infantile state, being that by which this letter is expressed.

In the English language, this letter has four different sounds. The broad sound, as in *all*, *fall*. The open, as in *father*, *rather*. The slender or close, which is the peculiar *a* of the English, exemplified in *place*, *face*, &c. And the short sound, of which we have instances in *hat*, *cat*, *fat*.

Among the Romans, was used in giving votes. In their Comitia there were two tables: in the one were two letters *U R* *uti rogas* signifying the people's assent, in the other the letter *A*, i. e. *antiquo* or *antiqua probo*, to shew their dissent. In capital causes they had also two tables covered with wax: in one of which was this letter *A*, i. e. *absolutio*, in the other *C*, for *condemno*, whence the former is by Tully, *pro Milone*, called *salutatis*, the latter *tristis*.

In numerals *A* denoted 500, and *Ā* 5000. In the Julian calendar, *A* is the first of the seven dominical letters.

Among logicians, it denotes an universal affirmative proposition.

**A**, as a word, has the following significations. 1 *A*, an article set before nouns of the singular number, a man, a tree. Before a word beginning with a vowel, it is written *an*, as, *an ox*, *an egg*. 2 *A* is sometimes a

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noun, as, great 1 3 *A* is placed before a participle, or participial noun. *A* hunting Chilo. 4 *A* has a signification denoting proportion. The landlord hath a hundred *a* year (100 to 1). 5 *A* is used in burlesque poetry, to lengthen out a syllable. For cloves and nutmegs to the line *a* (*Dryden*). *A* is sometimes put for *he*, as, will *a* come, for will *he* come. 7 *A*, in composition, seems sometimes the French *à*, and sometimes *at*, as *aside*, *aslope*, *awant*, *aworry*, *astrip*. 8 *A* is sometimes redundant as *arise*, *arouse*, *quake*, namely the same with *rise*, *rouse*, *wake*. 9 *A*, in abbreviations, stands for *annum*, or *arts*, as *A M a trum magister*, or *anno*, as *A D anno domini*.

*A*, or before a vowel *an*, in medical and other technical terms, a preposition or prefix, which negatives or reverses the meaning of the radical term itself.

In medical prescriptions, this letter with a dash above it, *ā*, is used for *ana*, of each.

In music *A* is the nominal of the sixth note in the diatonic scale, it is also the name of one of the two natural moods.

The chemists use *AAA* to denote amalgam or amalgama.

**AA**, the name of several rivers, as of three in Switzerland, one in France, one in Brabant, one in Russia, and of several of small note in Germany.

**AAC II**, a town of Nellenburgh, in Switzerland, it is situated on an eminence (near a river) the same name, which falls into the lake of Zell, fourteen miles N. E. of Schaffhausen. Lat 47 55 N. Long. 9 E.

**AALBERG**, or **AALBORG**, capital of a bishopric of the same name in the north part of Jutland. It is situated on the south shore

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**of Lynfort gulf** This ancient city, next to Copenhagen, is the richest and most magnificent in Denmark. Here is an exchange for merchants, and the harbour is deep and secure, but its entrance dangerous. A considerable trade is carried on here in guns, pistols, and gloves. In 1534 it was taken by Clement, the pirate, and in 1643 and 1658 by the Swedes. Lat 56 50 N Lon 9 47 E.

**AAM, or HAAM**, a liquid measure in common use among the Dutch, containing about 888 English pints.

**AAR**, the name of two rivers, one in Switzerland, and another in Westphalia in Germany. It is also the name of a small island in the Baltic.

**AARON**, (*אֲרֹן*, an ark, or chest) the name of the ark of the testimony, in which, among the Hebrews, the cherubim stood in the holy of holies. In Scripture history, the son of Amram, Iorachel, and grandson of Levi, was born A. M. 2130. He was three years older than his brother Moses, and was appointed to aid him as his advocate and interpreter, in the rescue of the Israelites from their Egyptian bondage. The two brothers went together into Egypt, and accomplished their object A. M. 2513. During the peregrination of the Israelites in the Wilderness Aaron and his sons exercised the office of priests by a divine appointment, and, as soon as the tabernacle was built Aaron was consecrated by Moses. During the continuance of Moses in the mount, whither he went to receive the law, the people became impatient and tumultuous, and Aaron, yielding to their solicitations, melted down their pendants, ear rings, &c. and formed the golden calf to which they paid homage. He afterwards hallowed himself for this offence, obtained forgiveness, and was continued in the priesthood. He was confirmed in this office by the miracle of the almond tree, which blossomed, and which was deposited in the rock holy place, in order to perpetuate his title and the remembrance of this prodigy. He married Elisbi, the daughter of Ammidib, by whom he had four sons: two of these were destroyed by fire, but from the other two the race of the high priests of the Jews is continued from Aaron in regular succession. In consequence of his distrusting God at Meribah, he was debarred from entering Canaan. About a year before the Israelites entered the country, he wounded mount Hor, dislodged himself of the pontifical ornaments, in the view of the people, and put them upon Eleizer, eldest son, and his successor in the high

He then died in the arms of his son, at the age of one hundred and twenty-three years, and was buried in a cave of this mountain. In the place of his interment was concealed, probably under an apprehension that in future ages he might become an object of superstitious worship.

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**AARON**, a physical writer of the seventh century. He wrote in Syriac several treatises on medicine, entitled the Pandects, of which there are no remains. He was the first author who described the small pox and measles. He directed the vein under the tongue to be opened in the cure of the jaundice.

**AARON**, the Araite, Jewish physician at Constantinople 111294. He wrote a commentary on the Pentateuch, printed at Jerusalem in folio 1710, and a Hebrew grammar, printed at Constantinople, 1581.

**AARSINS** or **AERSENS** (Peter), a celebrated printer born at Amsterdam, in 1519. He printed a noble altar-piece, representing the crucifixion, at Antwerp, which was destroyed by the populace in the insurrection that happened there in 1566. He died in 1583, and left three sons, all eminent printers.

**AA VORA** in natural history, the fruit of a sort of large palm tree, in the West Indies, and in Africa furnishing an astringent benefit in diarrhoea.

**AB**, in the Hebrew chronology the eleventh month of the civil year, and the fifth of the ecclesiastical year, which begins with Nissan. The month Ab answers to the moon of July, and continued thirty days. In the Syriac calendar, Ab is the name of the last summer month.

**AB**, at the beginning of the names of places, generally shows that they have some relation to an abbey, as *Abingdon* (*Gibson*).

**ABACA** a kind of flax or hemp, obtained from the Molluscs, or Philippine lands.

**ABACINARI** a species of punishment used in the middle ages, in which criminals were blinded, by having hot metal held before their eyes.

**ABACK** (*ad* from *back*) Backward (*Spenser*).

**ABACOT** the name of an ancient cap of state worn by the kings of England, the upper part whereof was in the form of a double crown.

**ABACTORS** or **ABACTORES**, a name given to those who drive away, or rather steal cattle by heels. They are distinguished from *furis*, or thieves.

**ABACUS**, in midwifery, forcibly expelled (from the Latin, *abigo*, a miscarriage, produced by violence).

**ABACUS**, (*אֲבָקִים*, from *אֲבָק*, dust, Hebrew.) A table containing medical preparations such table, whether for medicine or other sciences, having formerly been projected on surfaces of sand or dust.

**ABACUS** & *palmula*, in the ancient music, denote the machinery, whereby the strings of the instruments were struck, with a plectrum made of quills. Sometimes also *abacus* signifies a kind of key board, an instrument for dividing the intervals of the octave.

**ABACUS**, in architecture, the superior

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member of the capital, to which it serves as a kind of crown. It was originally intended to represent a square tile laid over a basket, and it still retains its original form in the Ionic, Doric, and Ionic orders; but in the Corinthian and composite its four sides or faces are arched inward, forming some ornament, as a rose or other flower in the middle. This term is also used for a concave moulding on the capital of the Tuscan pedestal. And Palladio calls the plinth above the columns in the Tuscan and Doric orders by the same name.

**ABACUS**, **PYTHAGOREAN**, so denominated from its inventor, Pythagoras, a table of numbers continued for readily learning the principles of arithmetic, and was probably what we now call the multiplication table.

**ABACUS LOGISTICUS**, a right angled triangle whose sides about the right angle, contain all the numbers from 1 to 10, and its area the products of each two of the opposite numbers. This is called a *canon of arithmeticals*, and is no other than a multiplication-table carried to 60 both ways.

**ABADIR**, in the Roman mythology is the name of a stone which Saturn swallowed by the contrivance of his wife Ops, believing it to be his new born infant son Jupiter; hence it ridiculous becoming the object of religious worship.

**ABAFI** *a* (of ἀβαζ in Σικ) From the fore part of the ship toward the stern.

**ABAFITHEBEAM** denotes the relative situation of any object with the ship, when it is placed in that part of the horizon which is continued between a line at right angles with the vessel, and that point of the compass which is directly opposite to the ship's course.

**ABAGI**, a silver coin in Persia is equivalent to four suns to thirty six sols old French money or about seventeen pence English.

*To* **ABAHILNAIL** *v a* (*abaleno*, Lat) To make it another's which was our own before.

**ABAHILNATI** *v n* (*abalentatio* Lat) The act of giving up one's right to another.

*To* **ABANDON** *v a* (*abanare*, Fr) 1 To give up, resign or quit (*Dryden*) 2 To desert, to forsake (*Shakspeare*) 3 To for sake, to leave (*Spenser*)

**ABANDONED** *part a* Corrupted in the highest degree.

**ABANDONMENT** *v* (*abandonnement*, Fr) The act of abandoning.

**ABANET** (*אבנ* from אבן, Hebrew the griddle worn by the Jewish priests) In old medicine, a bandage for the waist.

**ABANGA** See **ADY**

**ABAPFISTON**, or **ABAPTISTA** in surgery, the saw *terrella* or perforating part of the instrument called the trepan. It is derived from the negative *a* and βαπτω, I immerse. See **TREPAN**.

**ABARTICULATION** *s* (from *ab*, from,

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and *articulus*, a joint Lat) That species of articulation that has manifest motion.

**ABAS** 1 The tænia, or tape-worm 2, The epileps, as an effect often hence produced.

**ABAS** a weight used in Persia, for weighing pearls.

*To* **ABAST** *v a* (*abasser*, Fr) To cast down, to depress, to bring low (*Sidney*)

**ABASTIMINI** *s* The state of being brought low, depression (*Eccelesiasticus*).

*To* **ABASH** *v a* (See **BASHFUL**) To make ashamed (*Milton*)

**ABASSA**, a silver coin current in Persia, worth about thirty-eight sols or eighteen pence English.

**ABASSIA** the modern name of a kingdom in Ethiopia Proper. It is large, mountainous, and comprehends the provinces of Bagmeder, Colima, Walka, Shewa, &c.

*To* **ABATI** *v a* (from the French *abatre*) 1 To lessen, to diminish (*Dantes*)

2 To deject, or depress the mind (*Dryden*)

3 To let down the rice in selling. 4 (In common law) 1) *abate* a writ, is by some exception to defend or overthrow it (*Cowell*)

*To* **ABATE** *v n* To grow less (*Dryden*)

**ABATE** in the manege signifies, that a horse when working upon curves, puts both his hind legs to the ground at once, and observes the same exactness at all the times.

**ABATIMINI**, a term used for a prohibition of trade to French merchants in the ports of the Levant, who will not stand to their bargains or who refused to pay their debts.

**ABATIMINT** *s* (*abatiment*, Fr) 1 The act of abating (*Locke*) 2 The state of being abated (*Job*) 3 The sum or quantity taken away by the act of abating (*Locke*)

4 The cause of abating, extenuation (*Attentive*)

**ABATEMENT** in heraldry, in accidental figure supposed to have been added to coats of arms in order to denote some dishonourable demeanour or stain whereby the dignity of coat of arms was rendered of less esteem.

**ABATEMENT** in law, the rejecting a suit through some fault either in the matter or proceeding. Among traders the sum with rebate or discount.

**ABATUR** *s* The agent or cause by which an abatement is procured (*Arbuthnot*)

**ABATIS**, an ancient term for an officer of the stables.

**ABATIS**, in fortification, a range of large trees laid side by side with their boughs outward, to hinder the approaches of an enemy.

**ABATOR**, in law, a term applied to a person who enters to a house or lands void by the death of the last possessor, before the true heir.

**ABATOS**, an island in the Lake Meotis, in Egypt, famous for being the sepulchre of Osiris, and for producing the reed papyrus, of which the ancients made their paper.

**ABATIUTA**, in music. An expression



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generally employed after a break in the tune of any piece by a *recitative*, or *cantabile ad libitum*; to apprise the performer that the measure is to be resumed, and the tune beaten as before.

**ABB**, a term among clothiers, applied to the yarn of a weaver's warp. They say also *abb wool* in the same sense.

**ABBA**, in the Syriac and Chaldean languages, literally signifies a *father*, and figuratively superior, reputed as a father in respect of dignity or affection. It is more particularly used in the Syriac, Coptic, and Arabic churches, as a title given to the bishops. The bishops themselves bestow the title *abba* more eminently on the bishops of Alexandria, which occasioned the people to give him the title of *Baba* or *Papa*, that is, *father of father*, a title which he bore before the bishop of Rome.

**ABBACY** *s* (*abbatia*, Lat.) The rights, possessions, or privileges of an abbot (*Ayliffe*).

**ABBADIE** (Junc.), an eminent divine, born at Nay, in Bern, in 1688. He took the degree of D D at Sedan, and was afterwards made minister of the French church at Berlin, by the elector of Brandenburg. On the death of the elector, in 1758, Dr Abbadie accompanied marshal Schonberg to England with the prince of Orange. He was with that great man when he fell at the battle of the Boyne in 1690, and on his return to London, was appointed minister of the French church in the Savoy, and not long after promoted to the deanery of Killaloe, in Ireland. He died in London, September 23, 1727. Abbadie was a very elegant writer, particularly upon theological subjects. His chief work is a "Treatise of the Truth of the Christian Religion," 1684. But several of his other performances have great merit. They exhibit strong tokens of great learning, and a fine imagination, and were much admired at the time of their publication.

**ABBÉ** in a monastic sense, the same with **ABBOT** in a modern sense, the name of a description of persons prevalent in France before the Revolution. They were persons who had not yet obtained any precise or fixed settlement in church or state, but were ready to accept any such as may become vacant. Their dress was rather that of an academic, or of a professed scholar than of an ecclesiastic. They were, in colleges, the instructors of youth, in private families, the tutors of gentlemen, and many procured a livelihood by their literary and witty productions of different kinds.

the superior of an abbey, or nuns. The abbess has the same rights and authority over the nuns, that the abbot regular has over their monks. Her office indeed does not allow her to perform the spiritual functions annexed to the priesthood. M. Maffey, in his *Remarks on the Rights of the*

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Church, observes, that some abbesses have formerly confessed their nuns. But he adds, that their excessive curiosity turned them to such lengths, that there arose a necessity of checking it.

**ABBEVILLE**, a town of France, in the department of the Somme, formerly the capital of Ponthieu in Picardy. It was fortified in 980, by Hugh Capet. It was the birth place of Nicolas Sanson, Pierre du Val, and Philip Briet, three celebrated navigators. Lat 50 7 N Lon 1 55 E.

**ABBEY**, a monastery, or religious house governed by a superior under the title of abbot or abbess. Abbeys differ from priories, in that the former are under the direction of abbots, the latter under that of priors; but an abbot and a prior differ in little more than the name. Monasteries were at first nothing more than religious houses, whither persons retired to spend their time in devotion. But they soon degenerated, and procured large privileges, exemptions, and riches. They prevailed greatly in Britain before the Reformation, and as they increased in riches the state became poor for the lands possessed by them could not revert to the lords who gave them. These places were wholly abolished in England at the time of the Reformation, Henry VIII having first appointed visitors to inspect into the lives of the monks and nuns, which were found in some places very disorderly upon which, the abbots, perceiving their dissolution unavoidable, were induced to resign their houses to the king, who by that means became invested with the abbey lands. These were afterwards granted to different persons, whose descendants enjoy them at this day. They were then valued at 2,853,000l per annum—in immense sum in those days! Every abbey had at least one person whose office it was to instruct youth, and the historians of this country are chiefly beholden to the monks for the knowledge they have of former national events. In these houses the arts of painting, architecture, and printing, were cultivated. The religious houses were hospitals for the sick and poor, affording likewise entertainment to travellers at a time when there were no inns.

**ABBEY-LUBBER** *s* A slothful lorrer in a religious house, under pretence of retirement and austerity (*Dryden*).

**ABBOT**, or **ABBAT**, the superior of a monastery of monks erected into an abbey or prebicy. The name abbot is originally Hebrew, where it signifies father. The Jews call *father* in their language, *ab*, whence the Chaldeans and Syrians formed *abba*, thence the Greeks *abbas*, which the Latins retained *abbas*, and hence our *abbot*, the French *abbe*, &c. The name abbot appears as old as the institution of monks itself. In early days, they were subject to the bishops and the ordinary powers, but at length there arose new distinctions be-

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tween them. *Mitred* abbots were privileged to wear the mitre, and exempted from the jurisdiction of the bishop—Others were called *crossed* abbots, from their bearing the cross or pastoral staff. Others were styled *acumenical* or universal abbots, in imitation of the patriarch of Constantinople, while others were termed *cardinal* abbots, from their superiority over all other abbots—Among us, the mitred abbots were lords of parsonage, and called abbots-*sovereign*, and abbots general to distinguish them from the other abbots. At present, in the Roman-catholic countries, the principal distinctions observed between abbots are those of *regular* and *commendatory*. The former take the vow and wear the habit of their order, whereas the latter are seculars, though they are obliged by their bulls to take orders when of proper age.

ABBOT is also a title given to others beside the superiors of monasteries, thus bishops whose sees were formerly abbeys are called abbots; as are the superiors of some congregations of regular canons, particularly that of St Genevieve at Paris, and among the Genoese, the chief magistrate of their republic formerly bore the title of Abbot of the people.

ABBOT (George), archbishop of Canterbury, was born October 29, 1562 at Guildford, in Surrey, where his father was a weaver. He was educated at the grammar school of Guildford, from whence he was removed to Balliol college, Oxford, of which, in 1593, he became a fellow. He took his degree of D D in 1597, and the same year was chosen master of University college. In 1599, he was made dean of Winchester, and the year following vice chancellor of Oxford, which office he again filled in 1603, and also in 1605. In 1609, he was appointed to the see of Litchfield and Coventry, from whence, in the same year, he was translated to London, and, in 1619, he succeeded Dr Buckeridge in the archiepiscopal see of Canterbury. He had the courage to oppose the court on some important occasions, particularly in the affair of the divorce of the lady Essex, and the famous book of sports, which he forbade being read at Croydon. A sad misfortune happened to him at the close of his life, for being invited to spend the summer at the seat of lord Zouch, he was one day persuaded to exercise himself in the park with a cross bow, and by accident shot the keeper instead of the deer. A commission was appointed to examine whether this irregularity incapacitated him from discharging the office of primate, and the determination being left with the king, he gave it in favour of the archbishop. He ever after kept a monthly fast on account of the misfortune, and settled twenty pounds a year on the widow of the keeper. He attended king James on his death bed, and assisted at the coronation of Charles I, but he soon lost the favour of this monarch, which was owing to

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the duke of Buckingham. He was at length, however, restored, but died soon after at Croydon, aged seventy one years. He was one of the eight learned divines of Oxford, to whom the care of translating the New Testament was committed. He wrote some learned theological pieces, and a "Brief Description of the whole World." He was distinguished by his natural talents, and by a considerable portion of acquired literature, he has looked upon as a man of great moderation toward all parties.

ABBOISBURY, a market town on the south-east of Dorsetshire. Lat. 50° 38' N. Long. 2° 42' W.

Lo ABREVIATIF *v* a (*abreger*, Lit.) 1 To shorten by contraction of parts, without loss of the main substance, to abridge (*Bac*) 2 To shorten, to cut short (*Brown*)

ABBREVIATION *s* 1 The act of abbreviating 2 The means used to abbreviate, as characters signifying whole words (*Swift*)

ABBREVIATION OF FRACTIONS in arithmetic and algebra, the reducing them to lower terms, that is, the proportional lessening of both the numerator and denominator. This may be performed either by continual division of the respective terms, or by dividing at once by the greatest common measure. Thus  $\frac{4}{8} = \frac{1}{2}$  by dividing both terms continually by 2, 4, and 8. Or, since 4 is the greatest common measure we have, at once  $\frac{4}{8} = \frac{1}{2}$ , by dividing by 4. Again,  $\frac{12abx^2}{4acx} = \frac{3abx}{ac}$  by dividing the terms successively by 4,  $a$ , and  $x$  which might be obtained at once by using  $4ax$  for a divisor. And  $\frac{a^2 + 6a + 9}{ax + x^2} = \frac{a + 3}{x}$  being the common measure.

ABBREVIATOR *s* One who abridges. ABBREVIATOR is more particularly used for an officer in the court of Rome appointed as assistant to the vice-chancellor, for drawing up the pope's briefs, and reducing petitions, when granted by the pontiff into proper form, for being converted into bulls. The abbreviators are supposed by Crompton to be the successors either of the *cancllarii* in the imperial household, or of the seven *notarii*, said to have been placed by pope Clement I in the seven quarters of Rome, to write down the acts of the martyrs within their several districts. They are said to have taken their name, either from their writing the *breves*, *briefs*, or shorter epistles of the popes, or from their making use of *nota*, or abbreviations in writing. The latter opinion may seem the more probable, in that the name is sometimes used by writers of the sixth age, and synonymous with *notarii* or *breuiatores*.

ABBREVIATURE *s* [*alrematura*, It.] 1 A mark used for the sake of shortening 2 A compendium or abridgment (*English*)

ABREUVOIR *s* (In French, a water-

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ing place.) Among masons the joint or juncture of two stones

**A, B, C**, pronounced *abce* 1 The alphabet. 2 The little books by which the elements of reading are taught (*Shakspeare*)

**ABCASSIA**, or **ABASSIA** a subdivision of Georgia, in Asiatic Turkey, being the most northern part of that province. The inhabitants live in mean low huts and go almost naked. Each person has an idler, that his neighbour is his enemy, and if, by any stratagem, he can catch him, sells him for a slave to the first Turk, Persian, or Tartar that appears in the country. Lat 45 to 45° N Ion 39 to 43° E

**ABCLDARY**, **ABCDARIAN** or **ATFCDARIAN**, is sometimes applied to compositions whose parts are disposed in the orders of the letters of the alphabet. In this sense abcdarian is synonymous with alphabetic.

**ABCT DL**, or **ABSCUPE**, (from *abcedo*, to keep asunder,) a term in surgery, signifying, really the same thing as to suppurate. See **ABCESS**, **PUS**, and **SUPPURATION**

**ABDALLIS**, a tribe of the Afigans who are also called Duranians. The authority of their king extends over Ghim, Cuchhur, Cichul, Pashawer, with a part of Multan, and Sind on the side of Persia, a great part of Caracum and Shestaun, and all Bunn on the side of Tartary

**ABDI**, a Persian word, properly signifying the water placed in a basin for washing the hands, but used to imply the legal purifications practised by the Mahometans before they enter on their religious ceremonies

**To ABDICATE** *v a* (*abdico* Lat.) To give up, to resign applied commonly to some right to office (*Addison*)

**ABDICATION**, **ABDICATIO** derived from *abdicare*, to renounce, the act whereby a magistrate, or person in office renounces, and gives up the same before the legal term of service is expired. Abdication is frequently, confounded with resignation, but strictly speaking, there is a difference abdication being done purely and simply, while resignation is done in favour of some third person

**ABDICATION**, among Roman writers, is more particularly used for the act whereby a father, discarded or disinherited his son and expelled him from the family. In this sense, the word stands opposed to adoption

**ABDICATIVE** *a* That causes or implies abdication

**ABDOMEN**, (from *ab* a nourisher or comforter, and *domen*, the faces.) The word, however, is of doubtful origin, and hence some have it from the Latin *alido* to hide, because it includes and hides the lower part, while a third class trace it from *eldeo* to hide, and *omentum*, the paul. The abdomen or belly is the largest cavity in the body bounded superiorly by the diaphragm, by which it is separated from the chest, inferiorly

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riorly by the bones of the pubis *ischium*, on each side by various muscles, the short ribs, and *ossa lu*, anteriorly by the abdominal muscles, and posteriorly by the vertebrae of the loins, the *os sacrum* and *os coccygis*. Internally it is invested by a smooth membrane called peritonium, and externally by muscles and common ligaments. In the cavity of the abdomen are contained 1. interiorly and laterally the mesentery, the epiploon, omentum, or caul, the stomach, the large and small intestines, the kidneys, the pancreas, the spleen, the liver and gall bladder. 2. Posteriorly and without it peritonium the kidneys, the upper renal glands, the ureters, the rectopitricum chylus, or chyle reservoir, the descending aorta, the ascending vena cava. 3. Interiorly in the pelvis and without the peritonium, in the urinary bladder, the peniculate vessels, the mesenteric rectum. In vena cava, beside the urinary bladder and intestinal rectum there are the uterus, the four ligaments of the uterus, the two ovaria, the two Fallopian tubes, the vagina. The fore part of this cavity, has been mentioned, is covered with mucus and common integument in the middle of which is the navel. It is this part of the body which is properly called *abdomen*, it is distinguished by anatomists into regions. See **EPIGASTRIC**, **HYPochondriac**, **UMBILICAL** and **HYPOGASTRIC REGIONS**. The posterior part of the abdomen is called the loins, and the sides the epicolic regions.

**ABDOMINAL VESICLES** In the Linnéan system, class in order 4 their character being gills long, ventral fins placed on the belly behind the throat. See **ZOOLOGY**

**ABDOMINAL HERNIA** (*Hernia abdominalis*) A tumour situated on the external part of the abdomen arising from the protrusion of part of its viscera not through any natural opening, but through the weaknesses of muscle by the pulling of muscular fibres from weakness or from an accidental wound of the abdomen

**ABDOMINAL MUSCLES** See **MUSCLES**

**ABDOMINAL RING** (*Anulus abdominalis*) Inguinal ring. An oblong, tendinous opening in both groins through which the spermatic cord of men, and round ligaments of the uterus of women pass. It is through this opening that the intestine or omentum falls in ruptures, forming that species of hernia called *lunonocle*

**To ABDUCE** *v a* (*abduco* Lat.) To draw to a different part, to withdraw one part from another (*Brown*)

**ABDUCTORIAL NERVES** (*nervi abductores*) The sixth pair of nerves are so called because they go to the rectus externus oculi, which muscle was formerly termed the abductor. They arise from the *medulla oblongata*, between the *corpora pyramidalia* and *pons varolii*. They then advance, perforate the dura

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mater, and go out of the cranium through the superior orbital fissure, and are distributed in the *rectus externus* muscle of the bulb of the eye.

**ABDUCTION**, in logic, a kind of argumentation, by the Greeks called *apagogē*, wherein the greater extreme is evidently contained in the medium, but the medium not so evidently in the less extreme is not to require some further medium or proof to make it appear.

**ABDUCTOR** (*abductor*, *oris*, *m* from *ab* and *duco*, to draw) A name given to those muscles which pull brief parts of the body into which they are inserted, i. *abductor auricularis* *auris*, muscles of the external ear, *abductor indicis*, of the fore finger, *abductor longus pollicis*, of the thumb, *abductor digiti minimi manus* of the little finger, *abductor minimi pedis*, of the little toe. It is an inconvenience to which the art of surgery is yet subject, that these and other muscles are denominated differently by different writers and professors. Thus the *abductor digiti minimi manus* is, by Winslow, called *hypothenor minor*, and, by Douglas, *extensor tertii interdigitalis minimi digiti*.

**ABELI DARIAN** (from the names of *a*, *l*, *c*) A teacher of the alphabet, or first rudiments of literature.

**ABECLDARY** *a* Belonging to the alphabet.

**ABED'** *ad* (from *a*, for *at*, and *bed*) In bed.

**ABIGAL**, (from *aligo*, to expel, because it was thought to promote lively) The ground-pipe or chancre-pipe.

**ABLI** (Charles Frederic), an eminent musical composer and performer, was a native of Germany and a disciple of Sebastian Bach. He came to England in 1759, where he soon attracted notice both as a public performer and as a private teacher. He was irascible in his temper and apt to be overbearing. He put an end to a complaint of spitting of blood (under which he laboured) and to his life by excess of drinking. He died in London June 20, 1787. "His concertos and other pieces," says Dr Burney, "were very popular, and frequently played on public occasions. The taste and science of Abel were rather greater than his invention, so that some of his later productions, compared with those of young composers, appeared languid and monotonous."

**ABELLARI** (Peter), a celebrated doctor of the twelfth century, was born at Palais in Brittany, in 1079. He was well learned in divinity, philosophy, and the languages, but was particularly distinguished by his skill in logic. At the age of forty, Abelard sacrificed the reputation which he had acquired to the love of pleasure, and discovered himself by forming and executing a deliberate plan for the seduction of female innocence. He read lectures in divinity with great applause in Paris,

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where he boarded with a canon whose name was Fulbert, and who had a very beautiful niece, named Heloise. The canon, anxious to see this young lady make a figure among the learned, chose Abelard for her preceptor, but instead of instructing her in the sciences, he roused in her heart that most violent passion, which some denote with the name of love, in consequence of which she became pregnant, and, at Abelard's request, leaving her uncle, she went to his sister's in Brittany, where she was delivered of a son. To soften the canon's resentment, he afterwards married her, though her romantic notions made her long hesitate in her relations, however, enraged at his conduct, hired ruffians, who broke into his chamber by night, and inflicted on his person, a disgraceful and cruel mutilation. On this he harshly and selfishly compelled Heloise to devote herself to religion in the abbey of Avenant. Abelard sought the gloom of a cloister, in order to conceal his confusion and shame, and assumed the monastic habit in the abbey of St Dennis, but the disorders of that house soon drove him thence. He was afterwards elected superior of the abbey of Rouen, in the diocese of Vannes, but here his endeavours at reformation brought his life into danger. After a life of extraordinary vicissitudes, Abelard died in the priory of St Marcellus, near Chillon, April 21, 1142. The body being sent to Heloise was deposited in the Paraclete. The names of this couple are celebrated by the epistles published by Pope and other poets. Heloise died in 1165, and was buried in the Paraclete, and in 1760 the abbess madame de Ron ordered their bones to be placed in a leaden coffin and then deposited under the altar. She also caused a monument of black marble, with a Latin inscription, to be placed over the spot.

**ABELL** See **POPPIUS**.

**ABELLIANS** A sect of heretics, who regulated marriage after the example of Abel, who they pretended was married but died without ever having known his wife.

**ABELLI** (John), an English musician, celebrated as a singer, and as a player on the lute. He belonged to the chapel of Charles II., and so continued till the revolution, when he was dismissed on account of his being a papist. He then visited the continent, and gained considerable sums as a public singer, but sometimes his extravagance brought him so low, that he was obliged to travel on foot with his lute at his back. Being once at Warsaw, the king of Poland sent for him to court, but Abell refused going; on which peremptory orders were given to compel his attendance. On his arrival he was seated in a chair in a spacious hall, and then drawn up to a great height when the king and his train appeared in a gallery opposite to him. Several wild beasts were then hurried into the hall below, and the king told him to take his choice,

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either to sing or to be let down among the boys. Abell preferred the first, and used to say afterwards that he never sung so well in his life. After leading this course many years, he came back to England, and in 1701, published a collection of songs in several languages when he died is unknown. He is said to have had the wit of preserving the natural tone of his voice to extreme old age.

**ABELMOLUI** Among Arabian physicians, the viscous, or palmus christi, whence the expressed juice, called castor oil, is obtained.

**ABELMOSCH** The tritiscus, or marsh-mallow, so named from its odour.

**ABEN'L GAULEY** A fixed star of the second magnitude in the constellation Libra.

**ABER-AVON** A seaport and borough town of Glamorganshire, situated on Swansea bay. Lat 51 38 N Lon 3 50 W.

**ABERBROTHICK**, a royal burgh in the shire of Forfar, in Scotland. It is one district, which with Montrose, Aberdeen, Brechin, and Inverberry, sends a member to parliament in its turn. It is a market town, and the seat of a presbytery, it has eleven parishes. Here was formerly the highest and richest monastery in Scotland. It is about forty miles N N F of Edinburgh, and, contains about 3,500 inhabitants.

**ABERDEEN**, the name of two cities in Scotland, called the Old and New Town, situated on the German Ocean, in W Long 1 4 and N Lat 57 6. The Old Town lies about a mile to the north of the New, at the mouth of the river Don, over which is a fine Gothic bridge of a single arch, greatly adorned, which rests at both ends on two rock. The New is the capital of the shire of Aberdeen. For largeness, trade, and beauty, it greatly exceeds any town in the north of Scotland. It is built on a hill of rising ground, and lies on a small bay formed by the Dee, deep enough for a ship of 200 to 35, and above two miles in circumference. Aberdeen, including the Old Town, contains 17,007 people. Its trade is considerable, but might be greatly extended by an attention to the white fisheries. King's College, and the Marischal College, in the New Town, form one university, called the University of King Charles.

**ABERDEENSHIRE**, a county in the middle division of Scotland, which sends two members to parliament. It contains the districts of Burs, Glentanner, Glenmich, Strathdee, Strathdon, the braes or hills of Mar and Garioch, the greatest part of Buchan, Forfar, Garioch, and Strathbogie. Its inhabitants amount to 120,000.

**ABEUVIN**, in ornithology. See *Struthio*.

**ABEREMURDER**, plain or downright murder, as distinguished from the less heinous crimes of manslaughter, and chance-medley. It is derived from the Saxon *abere*, ap-

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parent, notorious, and *morth*, murder, and was declared a capital offence without fine or commutation, by the laws of Canute, and of Henry I.

**ABERFORD**, a market town in the West-Riding of Yorkshire, celebrated for its pin manufactory. Lat 53 40 N Lon 1 18 W.

**ABERGAVERNNY**, a handsome town of Monmouthshire, in Wales. It is one hundred and forty-two miles from London, and is governed by a bailiff, recorder, and twenty-seven burgesses. Lat 51 48 N Long 3 5 W.

**ABERNETHY** (John), an eminent divine, was born at Coleraine in Ireland, Oct 19, 1660. In conformity to the advice of his friends, he declined the profession of physic, to which his views were at first directed, and devoted him self to the study of divinity under professor Campbell, at Edinburgh, though he had previously taken the degree of A M at Glasgow. In 1708, he was ordained pastor of a congregation at Antrim. Not long after this, a society of dissenting ministers was established at Belfast, the object of which was to shake off subscription to the Westminster confession, in which Abernethy concurred with great zeal. In 1726, the general synod passed a resolution that the non-subscribing ministers should not be of their body, in consequence of which many congregations became dissatisfied with their pastors. That of Abernethy dwindled away so much, that he accepted in invitation from the congregation of Wood-street, Dublin, where he continued till his death, in December, 1740. Two volumes of his sermons were printed at London, in 1748, and are deservedly held in great estimation particularly the first upon the divine attribute. He published several other works, and left behind him a diary of his life which bears ample testimony to the singular excellence of his disposition and character.

**ABERRANCE**, **ABERRANCY** : A deviation from the right way, a error, a mistake (*Glennville Brown*).

**ABERRANT**, *a* (from *alerrans*, I *at*) Wandering from the right or known way.

**ABERRATION** : (from *aberratio*, I *at*) The act of deviating from the common or right track (*Glennville*).

**ABERRATION**, in astronomy, a small apparent motion of the celestial bodies, occasioned by the progressive motion of light, and the earth's annual motion in her orbit. The word is compounded of *ab* from, and *erro* to wander, because the stars appear to wander from their true situation. This apparent motion is so minute, that it could never have been discovered by observations, unless they had been made with extreme care and accuracy, and although it naturally arises from the combination of the two causes just mentioned, yet it was never even suggested by theorists, until it was discovered by observation. It furnishes us with one of the strongest proofs of

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the truth of the Copernican system. The discovery is owing to the accuracy and ingenuity of the late Dr. Bradley, astronomer royal, he was led to it accidentally by the result of some careful observations, which he had made with a view of determining the *annual parallax* of the fixed stars. The history of this discovery is related by the doctor himself, in No 406 of the Phil Trans. Various explanations of the nature of aberration have been given by different authors; but we know not where to find, or how to devise, one which will be more satisfactory and familiar than that given by Dr Hutton in his Mathemat and Philosoph Dictionary, which is as follows. "This effect may be explained and familiarized by the motion of a line parallel to itself, much after the manner that the composition and resolution of forces are explained. If light have a progressive motion, let the proportion of its velocity to that of the earth in her orbit, be as the line BC to the line AC (Pl 1 fig 1 Astronomer) then by the composition of these two motions, the particle of light will seem to describe the line BA or DC, instead of its real course BC, and will appear in the direction AB or CD, instead of its true direction BC. So that if AB represent a tube, carried with a parallel motion by an observer along the line AC in the time that a particle of light would move over the space BC, the different places of the tube being A B, a, c, d, and when the eye, or end of the tube, is at A let a particle of light enter the other end at B, then when the tube is at a b, the particle of light will be at e, exactly in the axis of the tube; and when the tube is at c d, the particle of light will arrive at f, still in the axis of the tube. And lastly, when the tube arrives at CD, the particle of light will arrive at the eye or point C, and consequently will appear to come in the direction DC of the tube, instead of the true direction BC. And so on one particle succeeding another, and forming a continued stream or ray of light in the apparent direction DC. So that the apparent angle made by the ray of light with the line AF, is the angle DCE, instead of the true angle BCL, and the difference, BCD or ABC, is the quantity of the aberration. If light moved only one thousand times faster than the eye, and an object, supposed to be at an infinite distance, were really placed perpendicularly over the plane in which the eye is moving, it follows, from what has been said, that the apparent place of such object will always be inclined to that plane, in an angle of  $89^{\circ} 56\frac{1}{2}$ , so that it will constantly appear  $3\frac{1}{2}$  from its true place, and will seem so much less inclined to the plane, that way towards which the eye tends. That is, if BC be to AC as 1000 to 1, the angle BAC will be  $89^{\circ} 56\frac{1}{2}$ , and the angle ABC  $3\frac{1}{2}$  and  $\angle ABC$  will be  $7\frac{1}{2}$ , if the direction of the motion of the eye be contrary at one time, to what it is at

another. If the earth revolve about the sun annually, and the velocity of light were to the velocity of the earth's motion in its orbit, as 1000 is to 1, then it is easy to conceive, that a star really placed in the pole of the ecliptic, would to an eye carried along with the earth, seem to change its place continually, and neglecting the small difference on account of the earth's diurnal revolution on its axis, it would seem to describe a circle about that pole, whose radius is distant from it by  $3\frac{1}{2}$ . So that its longitude would be varied through all the points of the ecliptic every year, but its latitude would always remain the same. Its right ascension would also change, and its declination, according to the different situation of the sun in respect of the equinoctial points, and its apparent distance from the north pole of the equator, would be 7 less at the vernal, than at the verbal equinox. The greatest alteration of the place of a star, in the pole of the ecliptic, or, which in effect amounts to the same, the proportion between the velocity of light and the earth's motion in its orbit, being known, it will not be difficult to find what would be the difference, on this account, between the true and apparent place of any other star at any time, and, on the contrary, the difference between the true and apparent place being given, the proportion between the velocity of light, and the earth's motion in her orbit, may be found. After the history of this curious discovery related by Dr Bradley, in the places above referred to, he gives the results of a multitude of accurate observations made on a great number of stars at all seasons of the year, and at the same time he lays down a theory which corresponds to a surprising degree with the observations. He likewise annexed to the theory rules or formula for computing the aberrations of the fixed stars in declination and right ascension, which have been variously demonstrated, and reduced to other practical forms, by M. Clairaut in the Memoirs of the Academy of Sciences for 1737, by Mr Simpson in his Essays in 1740, by M. Fontaine des Cotes in 1744 and several other persons. The results of these rules are as follow. Every star appears to describe in the course of a year, by means of the aberration, a small ellipse, whose greater axis is  $40''$ , and the less axis perpendicular to the ecliptic, is equal to  $40''$  multiplied by the sine of the star's latitude, the radius being 1. The eastern extremity of the longer axis, marks the apparent place of the star, the day of opposition, and the extremity of the less axis, which is farthest from the ecliptic, marks the situation three months after. The greatest aberration in longitude is equal to  $20''$  divided by the cosine of its latitude. And the aberration for any time, is equal to  $20''$  multiplied by the cosine of the elongation of the star found for the same time, and divided by the cosine of its latitude. This aberration is sub-

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## ABERRATION OF THE PLANETS A

planet, considered as affected by aberration, appears in the place where it should have appeared at that instant which precedes the time of observation, by the interval of time occupied by light in passing from the planet to the earth. In the sun, the aberration in longitude is constantly 20", that being the space moved by the sun, or rather by the earth, in the space of 8 m 7 s which is the time employed by light in passing from the sun to the earth. And, knowing pretty nearly the distance of a planet from the earth at any time we shall have, as the distance of the sun, to that of the planet, so are 8 m 7 s to the time of light passing from the sun to the earth, then computing the places, &c. in motion in this time, in longitude, latitude, right ascension, or declination, it will be the planet's aberration, for whichever of these the eccentric motion was calculated, and it will be subtractive or additive, according as the planet's motion is direct or retrograde. It is evident that the aberration will be greatest in the longitude, and very small in latitude, because the planets deviate in a very small degree from the plane of the ecliptic, or path of the earth, on this account, the aberration in the latitudes of the planets is commonly neglected as nearly insensible, the greatest in Mercury being only  $4\frac{1}{2}''$ , and it is considerably less than this in the other planets. As to the aberrations in declination and right ascension, they must depend on the position of the planet in the zodiac. The aberration in longitude, being determined by the geocentric motion, will be nothing at all when the planet is stationary; and greatest in the superior planets when they are in opposition to the sun, but in the inferior planets when they are in their superior conjunction. These *maxima* of aberration for the several planets, when their distance from the sun is least, are as follow *georgium sidus* 25", *satur*, 27", *jupiter* 20", 8", *mars* 17", 8", *venus* 43", 2", *mercurius* 5", the moon,  $\frac{2}{3}$ ". Between these quantities and nothing the aberration in longitude of the respective planets, vary according to the *r* situations. And is the aberration of the sun, in longitude, although it varies not (as before observed) yet it causes a variation in the aberration in declination which is greatest (about  $\frac{1}{2}$ ") at the equinoxes where the sun's motion is most inclined to the equator, and is least (or absolutely nothing) in the solstices, where the sun's motion in the ecliptic is for a short time parallel to the equator. A quantity of aberration is occasioned by the diurnal rotation of the earth, but whether we consider it with respect to the sun, planets, or fixed stars, it is too small to be perceptible for, in the space of eight minutes, a point on the earth's surface moves through  $32'$  of a degree, and since small optic angles are nearly as the diameters they subtend, it is, as  $\text{radius} : \text{chord } 32' : 8'75''$  (sun's parallax)  $4'88''$ , the *maximum* of aberration from this cause. On



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the subject of this article we have already referred to *Simpson's Essays*, and *Memoirs Roy Acad. Scienc* for 1737 the matter is farther pursued by M. Clairaut, in those *Memoirs* for 1740. See also *Robinson's Tracts*, vol. II. p. 276, O. Gregory's *Astronomy*, chap. 22, La Fontaine's *Astronomy*, vol. III. p. 173—210, and Vince's *Astronomy*, vol. I. p. 32, &c. In the *Philos. Trans.* vol. 60, Dr. Price has given Remarks on the effects of aberration on the transit of Venus.

**ABERRATION**, in optics, that error or deviation of the rays of light when inflected by a lens or speculum, whereby they are hindered from meeting, or uniting in the same point called the *geometrical focus*, it is either lateral or longitudinal. The lateral aberration is measured by a perpendicular to the axis of the speculum, produced from the focus, to meet the reflected or refracted ray: the longitudinal aberration is the distance of the focus from the point in which the same ray intersects the axis. If the focal distance of any lenses be given, their apertures be small, and the incident rays homogeneous and parallel the longitudinal aberrations will be as the squares, and the lateral aberration as the cubes of the linear apertures. There are two species of aberration, distinguished according to their different causes: the one arises from the figure of the speculum or lens, producing a geometrical dispersion of the rays, when these are perfectly equal in all respects, the other arises from the unequal refringibility of the rays of light themselves, a discovery that was made by Sir Isaac Newton: and for this reason it is often called the *Newtonian aberration*. As to the former species of aberration or that arising from the figure, it is well known that if rays issue from a point at a given distance, then they will be reflected into the other focus of an ellipse having the given luminous point for one focus, or directly from the other focus of an hyperbola, and will be variously dispersed by all other figures. But if the luminous point be infinitely distant or which is the same the incident rays be parallel then they will be reflected by a parabola into its focus, and variously dispersed by all other figures. But those figures are very difficult to make, and therefore curved specula are commonly made spherical, the figure of which is generated by the revolution of a circular arc, which produces an aberration of all rays whether they are parallel or not: and therefore it has no accurate geometrical focus which is common to all the rays. Let BVF (Pl. 7. fig. 1. OPTICS) represent a concave spherical speculum, whose centre is C, and let AB, FF be incident rays parallel to the axis CV. Because the angle of incidence is equal to the angle of reflection in all cases, therefore if the radii CB, CF be drawn to the points of incidence and thence BD making the angle QBD equal to the angle CBA, and

FG making the angle CFG equal to the angle CFL, then BD, FG will be the reflected rays, and D, G, the points in which they meet the axis. Hence it appears that the point of coincidence with the axis is equally distant from the point of incidence and the centre: for because the angle CBD is equal to the angle CBA which is equal to the alternate angle BCD, therefore their opposite sides CD, DB are equal: and in like manner, in any other, GF is equal to GC. And hence it is evident that when B is indefinitely near the vertex V, then D is in the middle of the radius CV, and the nearer the incident ray is to the axis CV, the nearer will the reflected ray come to the middle point D, and the contrary. So that the aberration DG of any ray FFG, is always more and more, as the incident ray is farther from the axis, or the incident point F from the vertex V, till when the distance VI is sixty degrees, then the reflected ray falls in the vertex V, making the aberration equal to the whole length DV. And thus shews the reason why specula are made of a very small segment of a sphere, namely, that all their reflected rays may arrive very near the middle point or focus D, to produce an image the most distinct by the least aberration of the rays. And in like manner for rays refracted through lenses. In spherical lenses Mr. Huygens has demonstrated that the aberration from the figure, in different lenses, is as follows: 1. In all plano-convex lenses, having their plane surface exposed to parallel rays the longitudinal aberration of the extreme ray, or that most remote from the axis, is equal to  $\frac{1}{2}$  of the thickness of the lens. 2. In all plano-convex lenses, having their convex surface exposed to parallel rays the longitudinal aberration of the extreme ray, is equal to  $\frac{1}{2}$  of the thickness of the lens. 3. In all double convex lenses of equal surface, the aberration of the extreme ray is equal to  $\frac{1}{2}$  of the thickness of the lens. 4. In a double convex lens, the radii of whose sphere are 6 to 1, if the more convex surface be exposed to parallel rays, the aberration from the figure is less than in any other spherical lens, being no more than  $\frac{1}{12}$  of its thickness. Mr. Huygens has also shewn, that the same aberration is produced by concave lenses as by similar convex ones. It has been asserted chiefly on the authority of Sir Isaac Newton, that this species of aberration arising from the figure of the glass, is very inconsiderable when compared with that arising from the unequal refringibility of the rays of light; nay, it has been stated (Smith's Optics, book ii. cap. 6.) that the latter is to the former as 5449 to 1. Admitting the truth of this, it was thought very strange that objects should appear through refracting telescopes so distinctly as they are found to do: and indeed many persons desirous of success in the use and fabrication of lenses. But a little atten-



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the consideration of the subject will probably convince us that the above proportion is overrated. In consequence of the aberration a geometrical point after refraction is represented not by another geometrical point but by a very small circle, which has been called the circle of diffusion. And as, in the performance of optical instruments, it is necessary that this extended representation of any point be so small that it may not sensibly interfere with the representations of the points adjacent to it, and thus cause indistinct vision, a limit is set to the extent of the refracting surface (that is, to the aperture) which must be employed to produce this representation. But this evidently diminishes the quantity of light, and renders the vision obscure, though distinct. The nature of these aberrations may be finely illustrated by receiving on white paper the light of the sun refracted through a globe or cylinder of glass filled with water. If the paper be held parallel to the axis of the cylinder, and close to it, the illuminated part will be bounded by two very bright parallel lines, where it is cut by a diacritic curve, and these lines will gradually approach each other as the paper is withdrawn from the vessel, till they coalesce into one very bright line. If the paper be held with its end touching the vessel, and its plane nearly perpendicular to the axis, the whole process of the curve will be distinctly seen. We know that the doctrine of aberrations has been considered in a manner independent on caustic curves. But whoever considers the progress of rays in the eye-piece of optical instruments, will see that the knowledge of diacritic curves determines directly, and almost accurately, the form and images that are formed there. It is of great importance to attend to the manner in which the light is distributed over the surface of the circle of smallest diffusion, for this is the representation of one point of the infinitely distant radiant object. Each point of a planet, for instance, is represented by this little circle, and as the circles representing the different adjacent points must interfere with each other, an indistinctness must arise similar to what is observed when we view an object through a pair of spectacles which do not fit the eye. The indistinctness must be in proportion to the number of points whose circles of diffusion interfere, that is, to the area of these circles, provided that the light is uniformly diffused over them; but if it be very rare at the circumference, the impression made by the light belonging to the adjacent points must be sensible. Accordingly, Sir Isaac Newton found that the indistinctness of telescopes arising from the spherical figure of the object-glass was incomparably less than that arising from the unequal refrangibility of light, as before mentioned. It is much to be regretted that

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this very eminent philosopher should have committed such an oversight; for the authority of his great name hindered others from examining the matter, trusting to his assertion that the light was so rare at the borders of this circle, contrary to the very nature of a caustic, in which the light is infinitely dense at these borders. The first person who detected this oversight of the British philosopher was the celebrated abbe Boscovich, who, in a dissertation published at Vienna, in 1707, shewed by a very beautiful analysis, that the distribution was extremely different from what Newton had supposed, and that the superior indistinctness arising from unequal refrangibility was very considerably less than he had stated. The abbe's delicate and interesting process cannot possibly be explained in the compass of this article. Many ingenious philosophers in different parts of Europe have paid great attention to the subject of optical aberration, particularly with a view to improve the structure of refracting telescopes. A brief account of their labours will be found under the article ACHROMATIC.

**ABERRING** *part (alerno, Lat) Going astray, wandering (Brown)*

**To ABERUNCALIE** *v a (averunco, Lat) To pull up by the roots*

**ABERYSTWITH**, in geography, a market town of Cardiganshire, in Wales. It carries on a trade in lead, calamint, and fish. It is two hundred and three miles from London. Lat 52° 5' N Long 4° W

**ABFSTA**, or **AVESTA**, the name of one of the sacred books of the Persian Magi, which they attribute to their great founder Zoroaster, or Zerdusht. The Avesta is a commentary or exposition of two other of their religious books, called Zend and Zend

**To ABET** *v a (from betan, Sax) To push forward another, to support him in his designs by connivance, encouragement, or help (Spenser)*

**ABETMENT** *s* The act of abetting. **ABLTOR**, in law, one who incites or encourages another to perform something criminal, or by some way assists him in the performance itself. They are abettors in felony, but not in treason, the law looking on all concerned in treason, as principals.

**ABEX**, or **HABASH**, a country in Higher Ethiopia, in Africa, bordering on the Red Sea, by which it is bounded on the East. It is about five hundred miles long, and one hundred broad, and is said to have more wild beasts than men for inhabitants. The heat is almost insupportable, and the air very unhealthy.

**ABEYANCE**, **ABEIANCE**, or **ABEYANCE**, in law-books, something that only exists in expectation, or in the intendment, or remembrance of the law. Abeyance in law, amounts to much the same with *in jure*, among the Romans and

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*abeyance*, or *in abeyance*, among the Greeks; i e *hereditas operata* or *expectata*, or rather *no-num dominium expectans*. As civilians say land and goods do *jacere*, so common lawyers say, that things in like condition are in abeyance. It is a maxim in law, that of every land, either there is a fee simple in somebody, or it is in abeyance.

**ABGARUS** in biography, a name given to several of the kings of Edessa.

To **ABHOR** *v a* (*abhorreo*, Lat.) To hate with acrimony, to loathe (*Milton*).

**ABHORRENCE**, **ABHORRENCY** *s* (from *abhor*) 1 The act of abhorring, detestation (*South*) 2 The disposition to abhor, hatred (*Locke*).

**ABHORRENT** *a* (from *abhor*) 1 Struck with abhorrence (*Hamson*) 2 Contrary to, foreign, inconsistent with (*Dryden*).

**ABHORRER** *s* (from *abhor*) 1 A hater, a detester (*Swift*).

**ABIB**, signifying in ear of corn, a name given by the Jews to the first month of their ecclesiastical year, afterwards called Nisan. It answered to the latter part of our March and beginning of our April.

To **ABIDE** *v n* 1 abode or abid (from *abubian*, Sax.) 1 To dwell in a place, not to remove (*Genesis*) 2 To dwell (*Shakspeare*) 3 To remain, not to cease or fail (*Psalms*) 4 To continue in the same state (*South*) 5 To endure without offence, anger, or contradiction (*Hall*).

To **ABIDE** *v a* 1 To wait for, expect, attend, await (*Shakspeare*) 2 To hear or support the consequences of a thing (*Milton*) 3 To bear or support, without being conquered (*Woodward*) 4 To bear without aversion (*Sidney*) 5 To bear or suffer (*Pope*).

**ABIDFR** *s* (from *abide*) The person that abides or dwells in a place.

**ABIDING** *s* (from *abide*) Continuance (*Raleigh*).

**ABIES** (*abies*, *etis*, *f*) The fir (See **PINUS**) The medicinal virtues of the wood are like those of its barks, diuretic and sudorific. The species chiefly employed for this purpose are *abies alba* the white or silver fir, *abies balsamica*, balm of Gilead fir, *abies canadensis*, Canadian or Virginian fir, *abies picea*, or *sylvia*, red or pitch fir.

**ABJECT** *a* (*abjectus*, Lat.) 1 Mean; worthless; base (*Addison*) 2 Being of no hope or regard (*Milton*) 3 Mean and despicable (*Dryden*).

**ABJECT**, *s* A man without hope (*Psalms*). To **ABJECT** *v a* (*abjicio*, Lat.) To throw away.

**ABJECTEDNESS** *s* (from *abject*) The state of an abject (*Boyle*).

**ABJECTION**, *s* (from *abject*) Meanness and servility, baseness (*Hooker*).

**ABJECTLY**, *ad* (from *abject*) In an abject manner; meanly; basely; servilely.

## ABL

**ABJECTNESS** *s* (from *abject*) Servility, meanness (*Green*).

**ABILITY** *s* (*habilitas*, *Fi*) 1 The power to do any thing, whether depending upon skill, or riches, or strength (*Sidney*) 2 Capacity, qualification, power (*Dan*) 3 When it has the plural number *abilities* it frequently signifies the faculties or powers of the mind (*Rogers*).

**ABINGDON**, a town in Berkshire, having a market on Monday and Friday. It is a handsome town lying on the bank of the Thames, it has two churches, and sends two members to Parliament. Its earliest name was Shrovesham. Lat 51° 42' Long 1° 12' W.

**ABINTESTATE** *a* (of *ab*, from, and *intestatus*, Lat.) A term of law, implying him that inherits from a man, who though he had the power to make a will, yet did not make it.

**ABIOSOS** (from *ab*, neg and *bios*, to live) The creata, or hemlock, so called from its deadly qualities.

**ABJURATION** *s* A forswearing, or renouncing by oath. In the old law it signified a sworn banishment, or an oath taken to forsake the realm for ever. In its modern, and now more usual signification, it extends to persons, and doctrines, as well as places. Thus for a man to abjure the pretender by oath, is to bind himself not to own any regal authority in the person called the Pretender, nor even to pay him any obedience, &c.

To **ABJURE** *v a* (*abjuro*, Lat.) 1 To erst off upon oath, to swear not to do something (*Hale*) 2 To retract, recant, or abnegate a position upon oath.

To **ABLACTION** *v a* (*ablactio*, Lat.) To wean from the breast.

**ABLACIATION**, the weaning of a child from the breast. See **WEANING**.

**ABIACIATION**, in the ancient agriculture, is a method of engrafting, wherein the cion of one tree, being united for some time to the stock of another, is afterwards cut off, and, as it were, weaned from its mother-tree. Among the modern writers, abiaction is more usually called *inarching*, or *grafting* by approach.

**ABLAQUEATION** *s* (*ablaqueatio*, Latin) The practice of opening the ground about the roots of trees (*Evelyn*).

**ABLATION** *s*, (*ablatio*, Latin) The act of taking away.

**ABLATIVE** *a* (*ablativus*, Latin) 1 That takes away.

**ABLATIVE**, in grammar, the sixth case of Latin nouns. The word is formed from *auferre*, to take away. Priscian also calls it the comparative case, as serving, among the Latins, for comparing, as well as taking away. The *allative* is opposite to the *ablative*; the first expressing the action of taking away, and the latter that of giving. In English, French, &c. there is no precise mark whereby to distinguish the ablative from other cases, and we

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only use the term in analogy to the Latin. Thus, in the two phrases, *the magnitude of the city*, and *he spoke much of the city*, we say, *that of the city* in the first is *penitence* and in the latter *ablative*, because it would be so, if the two phrases were expressed in Latin. The question concerning the Greek ablative has been the subject of a famous literary war between two great grammarians, Frischlin and Crusius, the former of whom maintained, and the latter opposed, the reality of it.

**ABLE** *a* (*habile*, Fr *habilis*, Lat) 1 Having strong faculties, or great strength or knowledge, riches, or any other power of mind, body, or fortune (*Bacon*) 2 Having power sufficient, enabled (*Southern*)

*To ABLE* *v a* To make able, to enable (*Shakespeare*)

**ABLE-BODIED** *a* Strong of body (*Addison*)

**ABLECTI**, in Roman antiquity, a select body of soldiers, chosen from among those called *extraordinarii*

*To ABLEGATE* *v a* (*ablego*, Lat) To send abroad upon some employment

**ABLEGATION** *s* (from *ablegate*) The act of sending abroad

**ABLEGMINA**, in Roman antiquity, choice parts of the entrails of victims. The ablegmina were sprinkled with flour, and burnt on the altar, the priests pouring some wine on them.

**ABLENESS** *s* (from *alle*) Ability of body, vigour, force (*Sidney*)

**ABLIPTIA** (from *αβλῆσις* and *βλέπω* to see) Blindness Want of sight

*To ABLEGATE* *v a* (*ablego*, Lat) To tie up from

**ABLIGURATION** *s* (*allegitatio*, Lat) Prodigious expence on meat and drink

*To ABILOCATE* *v a* (*abloco*, Lat) To let out to hire

*To ABLUDE* *v n* (*alludo*, Lat) To be unlike

**ABLUENT** *a* (*alluens*, Lat) That has the power of cleaning

**ABLUTION** (from *aluo*, quasi *ab & lavo*, I wash away), in antiquity, a religious ceremony in use among the Romans, being a sort of purification, performed by washing the body, before they entered on sacrifice. Sometimes they washed their hands and feet, sometimes the head, and oftentimes the whole body for which purpose, at the entrance into their temples, were placed marble vessels filled with water. Ablutions appear to be as old as any religious ceremonies, and to have been adopted in almost every religion.

**ABLUTION** *s* (*ablutio*, Lat) 1 The act of cleansing, or washing clean 2 The water used in washing (*Pope*) 3 The rinsing of church vessels in water 4 The cup given, without consecration, to the laity in the popish churches.

*To ABNEGATE* *v a* (*abnego*, Lat) To deny

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**ABNEGATION** *s* (*alnegatio*, Lat) Denial, renunciation (*Hammond*)

**ABNODATION** *s* (*alnodatio*, Lat) The act of cutting away knots from trees

**ABNORMOUS** *a* (*alnormis*, Lat) Out of rule, irregular, misshapen

**ABO**, the metropolis of Finland Proper, Sweden. It was built 1155. The university, which was founded about 1226, is under the archbishopric of Upsal. In 1640 it was made an university. It was almost reduced to ashes by a dreadful fire in 1678. In 1713 it was taken by the Russians, who kept it till 1720, when it was restored to Sweden by the peace of Nystadt. Lat 60 27 N Ion 22 14 E.

**ABOARD** *a* (from the French *a bord*, as *aller a bord*, *emoyer a bord*) In a ship (*Raleigh*)

**ABODE** *s* (from *alido*) 1 Habitation, dwelling (*Waller*) 2 Stay, continuance in a place (*Shakespeare*) 3 To make **ABODE** To dwell, to reside (*Dryden*)

*To ABODE* *v a* (*See BODE*) To foretoken or foreshow, to be prophetic (*Shakespeare*)

**ABOILMENT** *s* (from *to alode*) A secret anticipation of something future (*Shakespeare*)

*To ABOLISH* *v a* (from *aboleo*, Lat) 1 To annul, to make void (*Hooker*) 2 To put an end to, to destroy (*Hayn*)

**ABOLISHABLE**, *a* (from *alolish*) That may be abolished

**ABOLISHER** *s* (from *alolish*) He that abolishes

**ABOLISHMENT** *s* (from *alolish*) The **ABOLITION** } act of abolishing

destroying, effacing, or putting out of memory. It also signifies the leave given by the king, or judges, to a criminal accused to desist from further prosecution.

**ABOLIA**, a military garment it, worn by the Greek and Roman soldiers, it was lined or doubled, for warmth. There seem to have been different kinds of abolia, fitted to different occasions. Even kings appear to have used them. Caligula was affronted at king Ptolemy for appearing at the shows in a purple abolia, and by the éclat thereof turning the eyes of the spectators from the emperor upon himself.

**ABOMASUM**, (from *ab dimm* and *amasum*, the stomach) The fourth stomach of ruminating animals. The maw.

**ABOMINABLE** *a* (*abominabilis*, Lat) 1 Hateful, detestable (*Swift*) 2 Unclean (*Leviticus*) 3 In low and ludicrous language, it is a word of loose and indeterminate censure (*Shakespeare*)

**ABOMINABLENESS** *s* (from *abominabile*) The quality of being abominable, hatefulness, odiousness (*Bentley*)

**ABOMINABLY** *ad* (from *abominabile*) Excessively; extremely, exceedingly in the ill sense (*Arbutnot*)

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**TO ABOMINATE** *v a* (*abominari*, Lat) To abhor, detest, hate utterly (*Southern*)

**ABOMINATION** *s* 1 Hatred, detestation (*Suffl*) 2 The subject of hatred (*Genesis*) 3 Pollution, defilement (*Shakespeare*) 4 The cause of pollution (*2 Kings*)

**ABORIGINES**, originally a proper name, given to a certain people in Italy, who inhabited the ancient Latium, or country now called Campagna di Roma Whence this people came by the appellation is much disputed The name is now given to the primitive inhabitants of a country, in contradistinction to colonies, or new races of people

**ABORTIFLUS** (*abortivus*) In botany, a term applied to flowers without seeds

**ABORTION** (*alortio*, *abc*) Premature birth Originally used as a natural miscarriage in opposition to *alaceventer*, which implies the use of *force* The term is confined to the early months of pregnancy a miscarriage after the seventh month being called a premature labour

**ABORTIVE** *s* That which is born before the due time (*Peacham*)

**ABORTIVE** *a* (*alortivus*, Lat) 1 Brought forth before the due time of birth (*Shakespeare*) 2 That fails for want of time (*Southern*) That brings forth nothing (*Milton*)

**ABORTIVELY** *ad* (from *alortive*) Born without the due time, prematurely, untimely

**ABORTIVINIS** *s* (from *alortive*) The state of abortion

**ABORTIVUS**, (*alortiva*, *sc medicamentum* from *alortio*, to be steri<sup>d</sup>) *Antisthetics* Medicines capable of occasioning an abortion or miscarriage in pregnant women It is now generally believed, that the medicines which produce a miscarriage, effect it by their violent action on the system, and not by any specific action on the womb

**ABORTMENT** *s* (from *alorto* Lat) The time brought forth out of time an untimely birth (*Bacon*)

**ABOVE** *prep* (from *a*, *u* *high* in Saxon, *loven*, Dutch) 1 Higher place (*Dryden*) 2 More in quantity or number (*Erasmus*) 3 Higher in rank, power, or excellence (*Psalm*) 4 Superior to, unattainable by (*Suffl*) 5 Beyond, more than (*Locke*) 6 Too proud for, too high for (*Pop*)

**ABOVE** *ad* 1 Overhead, in a higher place (*Bacon*) 2 In the regions of heaven (*Pope*) 3 Before (*Dryden*)

**ABOVE ALL** In the first place, chiefly (*Dryden*)

**ABOVE-BOARD** In open sight without artifice or trick (*11 strange*)

**ABOVE-CRIED** Cried before (*11 dison*)

**ABOVE-GROUND** An expression used to signify, that a man is alive not in the <sup>grave</sup>

**ABOVE-MENTIONED** Mentioned before.

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**ABOUKIR**, in geography, a small town of Egypt, situate in the desert between Alexandria and Rosetta This place has been rendered famous by the engagement in 1798, between the English and French Fleets, in which the former obtained a signal victory on this account the commander Nelson, was honoured with a postage Aboukir is the ancient Canopus

**TO ABOUND** *v n* (*abundo*, Lat *abonder*, French) 1 To have in great plenty (*Dryden*)

2 To be in great plenty (*Pope*)

**ABOUT** *prep* (*abuzan*, or *abuzon*, Saxon) 1 Round, surrounding, encircling (*Dryden*)

2 Near to (*Ben Jonson*) 3, Concerning, with regard to, relating to (*Locke*) 4 Engaged in, employed upon (*Taylor*)

**ABOUT** *ad* 1 Circularly, in a round (*Shakespeare*) 2 In circuit, in compass (*Shakespeare*) 3 Nearly (*Bacon*) 4 Here and there, every where (*11 a Q*) 5 With respect to before a verb, is *about to fly*, upon the point, within a small time of 6 Round the longest way in opposition to the short straight way (*Shakespeare*) 7 To bring about, to bring to the point or state desired as, *he has brought about his purposes* 8 To come about, to come to some certain state or point 9 To go about a thing, to prepare to do it

**A Bp** for Archbishop

**ABRA**, a silver Polish coin, worth about one shilling

**ABRACADABRA**, a magical word, recommended by Serenus Samonicus as an antidote against agues and several other diseases It was to be written upon a piece of paper as many times as the word contains letters, omitting the first letter of the former every time, and then suspended about the neck by a linen thread *Abra cadabra* is the name of a god worshipped by the Syrians

**ABRAMAS** a king of Syria, in Persia, who, when his wife Panthea had been taken prisoner by Cyrus, and humbly treated, surrendered himself and his troops to the conqueror He was killed in the first battle he undertook in the cause of Cyrus, and his wife stabbed herself on his corpse Cyrus raised a monument on their tomb *See PANTHEA*

**TO ABRASE** *v a* (*alrado*, Lat) 1 To rub off to wear away from the other parts, to wear away by degrees (*Hale*)

**ABRAHAM**, (*father of the womb*, i e of a great multitude) the patriarch, was at first called **ABRAM** (*high father*) but his name was altered by divine appointment He was born 352 years after the flood, and **A M 2008**, according to the Hebrew chronology, in Ur of the Chaldees His father Tera went in his old age to reside in Haran, in Chanaan, where Abram received the divine promise that he should be the father of a great nation, on which he, with his wife Sarah, and his nephew Lot, left Haran, and dwelt for some time at Schem, where he built

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**ABRAHAM** in the Lord. A famine drove them from thence into Egypt, and on their return into Canaan a dispute arose between the servants of Abram and those of Lot, which induced the two kinsmen to part, Lot going towards Sodom, and Abram towards Mount Moriah. The conduct of Abraham in this instance was generous, and noble, while that of Lot was mean and ungrateful. He latter acted as one whose spirit had much weakened his attachment to religion, the former as one who was fully selected for preventing the universal prevalence of idoltry, and preserving among mankind (by means of his posterity) the knowledge and worship of God. When Lot was taken prisoner by the prince of Elam, Abram armed his servants, retook his nephew and all the spoil. Having no prospect of a child by Sarah, he took Hagar an Egyptian as a concubine, by whom he had Ishmael, but at the age of ninety he received a promise that Sarah also should have a son, and in consequence his name was changed to Abraham. At the same time circumcision was instituted. Going afterwards to Gerar, Sarah was delivered of a son named Isaac. When Isaac was grown to maturity Abraham was commanded, as a trial of his faith, to offer him up as a sacrifice but just as he was about to fulfil the divine command the angel of the Lord stopped his hand, and provided a ram for a burnt-offering. About 12 years after this, Sarah died. When Abraham was in the 141st year of his age, he married Keturah, by whom he had six sons, who were all heads of different nations. This venerable Patriarch died, in the year of the world 2183 aged 175 years, and was buried near Sarah his wife.

**ABRAHAMITES**, an order of monks exterminated for idolatry by Theophilus in the ninth century. Also the name of another sect of heretics who had adopted the errors of Paulus See **PAULICIANS**.

**ABRANIE**, a town of Fretinadura, in Portugal, supposed to be the Tubucci of Antoninus. Here is a Casa de Misericordia, or house of mercy, an hospital, and four convents. The number of its inhabitants is about 35,000. Lat 39° 19' N Lon 7 18 W.

**ABRASAX**, or **ABRAXAS**, the supreme god of the Basilidian heretics. It is a mystical word, composed of the Greek numerals  $\alpha, \beta, \gamma, \delta, \epsilon, \zeta, \eta, \theta$ , which together make up the number 365. For Basilides taught, that there were 365 heavens between the earth and the empyrean, each of which heavens had its angel or intelligence, which created it, each of which angels likewise was created by the angel next above it, thus ascending by a scale to the supreme being, or first Creator. The Basilidians used the word *Abrahas* by way of charm or amulet.

**ABRASION**, s. (See **ABRADE**) 1 The act of abrading; the rubbing off. 2 The matter worn off by the attrition of bodies.

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**ABRAXAS**, an antiquestone with the word *abrahas* engraven on it. They are of various sizes, and most of them as old as the third century. They are frequent in the cabinets of the curious, and a collection of them, as complete as possible, has been desired by several. There is a fine one in the abbey of St Genevieve, which has occasioned much speculation. Most of them seem to have come from Egypt, whence they are of some use in explaining the antiquities of that country. Sometimes they have no other inscription besides the word but others have the names of saints, angels, or Jehovah himself, annexed, though most usually the name of the Basilidian God.

**ABRI** ASI ad (See **BREAST**) Side by side, in such a position that the breasts may bear against the same line (*Shakspeare*).

**TO ABRIDGE** 1 a (*abreger* Fr *abbrevo*, Lat) 1 To make shorter in words, keeping still the same substance. (2 *Macr*) 2 To contract, to diminish, to cut short (*Locke*) 3 To deprive of, to cut off from (*Shakspeare*).

**ABRIDGED** OF *p* Deprived of, debarr'd from, cut short.

**ABRIDGER** s. (from *abridge*) 1 He that abridges, a shortener. 2 A writer of compendiums or abridgments.

**ABRIGING**, in algebra, the reducing of a compound equation or quantity to a more simple form of expression. Thus in the equation  $x^2 - cx + cd + cde = 0$ , putting  $g = cd$ , and  $s = cde$ , we have  $x^2 - cx + g + s = 0$ .

**ABRIDGMENT** s. (*abregement*, French) 1 The epitome of a larger work into a small compass, a compend (*Hooker*) 2 A diminution in general (*Down*) 3 Contraction reduction (*Locke*) 4 Restraint from any thing pleasing (*Southern*).

**ABRIDGMENT**, in literature, is the first of the acceptations given to the word above. Abridgments are in many cases necessary and useful, though it requires particular talents to perform the office of an abridger, well. The practice of abridging books that are read, or lectures of professors in different departments of science, so as to prune away superfluities and redundancies, and retain what is essential in point of fact, argument, or illustration, is highly beneficial as it may assist the judgment, while it eases the memory. The following specimens of the kind of abridgment we advert to, are taken from Doctor Rees's *Cyclopaedia*. Mr Hume's design in his Essay on Miracles, is to prove that miracles which have not been the immediate objects of our senses cannot reasonably be believed upon the testimony of others. His argument is, "That experience, which in some things is variable, in others uniform, is our only guide in reasoning, concerning matters of fact. Variable experience gives rise to probability only, an uniform ex- mounts to proof. Our belief of any 1 the testimony of eye witnesses, is decisive."

no other principle than our experience of the veracity of human testimony. If the fact attested be miraculous, here arises a contest of two opposite experiences, or proof against proof. Now a miracle is a violation of the laws of nature; and is a firm and unshakable experience has established these laws, the proof against a miracle, from the very nature of the fact, is as complete as any argument from experience can possibly be imagined, and if so, it is an undeniable consequence that it cannot be surmounted by any proof whatever derived from human testimony. Doctor Campbell, in his Dissertation on Miracles, shews the fallacy of Mr Hume's argument, by another argument, thus: 'The evidence arising from human testimony is not solely derived from experience on the contrary, testimony has a natural influence on belief antecedent to experience. The early and unlimited assent given to testimony by children, gradually contracts as they advance in life. It is, therefore, more consonant to truth to say that our diffidence in testimony is the result of experience, than that our faith in it has this foundation. Besides, the uniformity of experience in favour of any fact, is not a proof against its being reversed in a particular instance. The evidence arising from the single testimony of a man of known veracity, will go far to establish a belief in its being truthfully related. If his testimony be confirmed by a few others of the same character we can withhold our assent to the truth of it. Now, though the operations of nature are governed by uniform laws, and though we have not the testimony of our senses in favour of any violation of them, still, in particular instances we have the testimony of thousands of our fellow-creatures and those, too men of strict integrity, swayed by no motives of ambition or interest, and governed by the principles of common sense, that they were actually witnesses of these violations, the constitution of our nature obliges us to believe them. These two examples contain the substance of about 400 pages. The Abbe Gaulier has published A Method of making Abridgments in 2 vols 4to.

**ABRIZAN**, the name of a feast held by the old Germans on the 13th day of the month Fir, nearly corresponding to our September. The feast was preparatory to the autumnal rains, and it was the practice in the course of it to pour out water.

**ABROACH** *ad* (See **TO BROACH**). 1 In a posture to run out (*Swift*). 2 In a state to be diffused or propagated (*Shakspeare*).

**ABROAD** *ad* (compound of *a* and *broad*). 1 Without confinement, widely, at large (*Milton*). 2 Out of the house (*Shakspeare*). 3 In another country (*Hooker*). 4 In all directions, this way and that (*Dryden*). 5 Without, not within (*Hooker*).

**TO ABROGATE** *v a* (*abrogo*, Lat.) To take away from a law its force, to repeal; to annul (*Hooker*).

**ABROGATION** *s* (*abrogatio*, Lat.) The act of abrogating, the repeal of a law (*Claudian*). Abrogation stands opposed to rogation. It is distinguished from derogation which implies the taking away only some part of a law, from subrogation, which denotes the adding a clause to it, from derogation, which implies the limiting or restraining it, from dispensation which only sets it aside in a particular instance, and from antiquation, which is the refusing to pass a law.

**ABROMA**. In botany, a genus of the Iliadæan class polyadelphic, and order Monandria. Its generic character is as follows; calyx five-leaved, corolla five-petaled, nectary cup shaped, five cleft, filament five, inserted between the divisions of the nectary, each bearing three anthers, styles five, subulate, capsule membranaceous, five-celled, seed winged. There are only two known species of the Abroma, both of which are inhabitants of the East Indies, and the Cape of Good Hope. 1 A anastula leaves seven-nerved petals ovate lanceolate, pointed, lightly tinged. 2 A. Whelan leaves ovate lanceolate, pointed more or less toothed, p. denticles opposite the leaves.

**ABROTANUM** (*Artemisia*, *abrotanum*) from *abro* and *tan*, mortal because it never decays, or from *abro*, of and *tan* extension, from the delicacy of its texture. *Abrotanum mas* Common southernwood. *Artemisia abrotanum* of Linnaeus. *Artemisia fruticosa* foliis setosis ramosissimis. Class Angiospermia, order polygynia superflua. A plant possessed of a strong, and to most people an agreeable, smell, a pungent bitter and somewhat nauseous taste. It is supposed to stimulate the whole system, but more particularly the uterus. It is very rarely used unless by way of fomentation with which intention the leaves are directed by the London college in the decoction pro fomento. See **ARTEMISIA**.

**ABROTANUM FEMINA** *Santolina* Common lavender cotton. This plant *Santolina chama-cyparissus*, pedunculis unifloris, foliis quadrifariam dentatis of Linnaeus, possesses antihysterical, antispasmodic, and deobstruent virtues and may be employed in all cases as a substitute for the *abrotanum* of our pharmacopœias. See **SANTOLINA**.

**ABROTANUM MAS** See **ABROTANUM**.

**ABRUPT** *a* (*abruptus*, Lat.) 1 Broken, craggy (*Thomson*). 2 Divided, without anything intervening (*Milton*). 3 Sudden, without the customary or proper preparatives (*Shakspeare*). 4 Unconnected (*Ben Jonson*).

**ABRUPT LEAF** In botany, a term used only in pinnate leaves, which are said to be abruptly pinnate (*abrupte pinnatis*) when they have neither leaflets (*foliolis*) nor tendrils or clasper (*involu*) at the end.

**ABRUPTED** *a* (*abruptus*, Lat.) Broken off suddenly (*Brown*).

**ABRUPTION** *s* (*abruptio*, Lat.) Violent and sudden separation (*Woodward*)

**ABRUPTLY** *ad* (See **ABRUPT**) Harshly, without the due forms of preparation (*Sidney*)

**ABRUPTNESS** *s* (from *abrupt*) 1 In abrupt manner, haste, suddenness 2 Unconspicuousness, roughness, cragginess (*Woodward*)

**ABRUS** In botany, a genus of the Linnæan class *diadelphæ*, and order *decandria* of which the following is its generic character calyx absolutely four-lobed, the upper lobe broadest, filaments nine, united into a sheath at bottom, gaping at the back, stigma obtuse, seeds spherical. There is but one species, *A. precatorius*, or Jamaica wild liquorice. It is a native of both the Indies, Egypt, and Guinea. The plant is shrubby, twining, leaves pinnate, with many oblong leaflets, corols in axillary racemes, pale purple, legume oblong, seeds five or six, scarlet or white, with a black eye. It is these beautiful seeds which, in consequence of their resemblance to beads, are so frequently strung into necklaces and worn as an ornament by the fair of Africa, Asia, and even Europe.

**ABSCISS** (*abscissus*, *us*, in from *abr*, and *cedo*, to retire) The words *ἀποσπῆμι*, *apospimé*, and *ἀποσπῆμι*, *apospimé*, frequently used by Hippocrates, are translated by Celsus *abscissus*, and sometimes *oomica*. Hence the word *absciss* is generally used by modern authors to signify a suppurated phlegmon or inflammatory tumour. These terms appear originally, by their derivation, to import any sort of exclusion of morbid matter but Paulus Aegineta seems to have limited the signification of *absciss* to upputation, by defining *ἀποσπῆμι*, *absciss*, a corruption of the fleshy parts, muscles, veins, and arteries.

To **ABSCIND** *v a* To cut off

**ABSCISSA**, **ABSCISSE**, or **ABSCISSA**, of a conic section, or a curve, is a part or segment cut off a line at some certain point, which is determined by an ordinate to the curve. As AP or PB in the figures to *Abcissæ* (Plate 6, *Curves*) PQ being the ordinate. The *abscissæ* may either commence at the vertex of the curve, or at any other fixed point. And it may be taken either upon the axis or diameter of the curve, or upon any other line drawn in a given position. Hence there are an infinite number of variable *abscissæ*, terminated at the same fixed point at one end, the other end of them being at any point of the given line or diameter. In the common parabola, each ordinate PQ has but one *abscissæ* AP, in the ellipse or circle, the ordinate has two *abscissæ* AP, BP, lying on the opposite side of it and in the hyperbola the ordinate PQ has also two *abscissæ*, but they lie both on the same side of it. In general, a line of the second kind, or a curve of the first kind, have two *abscissæ* to each ordinate. But a curve of the third order may have three *abscissæ* to each ordinate, a line of the fourth order may have four; and so on. The use of the *abscissæ* is, in conjunction with the ordi-

nates, to express the nature of the curves, by some proportion or equation including the *abscissæ* and its ordinate, with some other fixed invariable line or lines. Every different curve has its own peculiar equation or property by which it is expressed, and different from all others and that equation or expression is the same for every ordinate and its *abscissæ*, whatever point of the curve be taken. So, in the circle, the square of any ordinate is equal to the rectangle of its two *abscissæ*, or  $AP \cdot BP = PQ^2$ , in the parabola, the square of the ordinate is equal to the rectangle of the *abscissæ* and a certain given line called the parameter, in the ellipse and hyperbola, the square of the ordinate is always in a certain constant proportion to the rectangle of the two *abscissæ*, namely, as the square of the conjugate to the square of the transverse, or as the parameter is to the transverse axis, and so for other properties in other curves. When the natures or properties of curves are expressed by algebraic equations, any general *abscissæ* is commonly denoted by the letter *x* and the corresponding ordinate by the letter *y*, the other or constant lines being represented by other letters. Then the equations expressing the natures of different curves will admit of various forms, according to the situation of the point at which the *abscissæ* is supposed to commence, or to the relations of the co-ordinates. Thus, if the *abscissæ* should be estimated from the vertex of the curve, or an end of the diameter, then the equations are as follow namely, for the

Circle,  $2dx - x^2 = y^2$ , where  $2d$  is the diameter AB

Parabola,  $px = y^2$ , where *p* is the parameter

Ellipse,  $\frac{x^2 y^2}{c^2} = 2tx - x^2$  } where  $2t$  is the transverse, and  $2c$  the conjugate axis

Hyperbola,  $\frac{x^2 y^2}{c^2} = \pm 2tx + x^2$  }

But if we take the *abscissæ* from the centre, then, in the

Circle,  $d^2 - x^2 = y^2$ , where  $2d$  is as before

Ellipse,  $\frac{x^2 y^2}{c^2} = a^2 - x^2$  } where  $2t$  and  $2c$  are as before

Hyperbola,  $\frac{x^2 y^2}{c^2} = x^2 - a^2$  }

We may likewise make use of *p* the parameter in the equations to the ellipse and hyperbola then, in the

Ellipse,  $\frac{2t y^2}{p} = 2tx - x^2$  } when the *abscissæ* are taken from the vertex

Hyperbola,  $\frac{2t y^2}{p} = x^2 \pm 2tx$  }

Ellipse,  $\frac{2t y^2}{p} = a^2 - x^2$  } when the *abscissæ* are taken from the centre

Hyperbola,  $\frac{2t y^2}{p} = x^2 - a^2$  }

In the hyperbola between the asymptotes, we denote CR by *x*, and RS by *y*, and the equation will be  $xy = ab$ , a known rectangle. And lastly, in the parabola, we may denote



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*Ap*, by *x*, as an abscissa, and *pQ* by *y*, as an ordinate, then the equation will be  $x^2 = py$ , *p* being the parameter. Here the absciss *x* may be either positive or negative, but the ordinates must always be positive. In the other cases the ordinates may be either positive or negative.

**ABSCISSION** *v* (*abscisso*, Lat) 1 The act of cutting off (*Whem*) 2 The state of being cut off (*Brown*)

**To ABSCOND** *v n* (*abscondo*, Lat) To hide one's self

**ABSCONDER** *s* (from *abscond*) The person that absconds

**ABSENCE** *s* (See **ABSENT**) 1 The state of being absent, opposed to presence (*Shaks*) 2 Want of appearance, in the legal sense (*Add*) 3 Inattention, heedlessness, neglect of the present object (*Add*)

**ABSENT** *a* (*absens*, Lat) 1 Not present, used with the participle *from* (*Pope*) 2 Absent in mind, inattentive (*Add*)

**To ABSENTE** *v a* To withdraw, to forbear to come into presence (*Shaks*)

**ABSENTEE** *s* He that is absent from his station, or employment, or country (*Dav*)

**ABSENTHIATED** *p* (from *absinthium*, Lat) Impregnated with wormwood

**ABSENTHIUM** (from *absinthium*) Any fluid impregnated with wormwood

**ABSENTHIUM** (*absinthium*, from *a*, neg. and *synthos*, pleasant) Wormwood, so named from the disagreeableness of its taste. It forms a species of the Linnæan class *syngenesia*, order *polygamia superflua*, and genus *artemisia*. See **ARTEMISIA**

**To ABSIST** *v n* (*absisto*, Lat) To stand off, to leave off

**To ABSOLVE** *v a* (*absolve*, Lat) 1 To clear, to acquit of a crime, in a judicial sense (*Shaks*) 2 To set free from an engagement or promise (*Wall*) 3 To pronounce a sin remitted, in the ecclesiastical sense (*Pope*) 4 To finish, to complete. Little used

**ABSOLUTE** *a* (*absolutus*, Lat) 1 Complete (*Hooker*) 2 Unconditional *as*, an absolute promise (*South*) 3 Not relative *as*, absolute space (*Stilling*) 4 Not limited *as*, absolute power (*Dryd*) 5 Positive, certain (*Shaks*)

**ABSOLUTE EQUATION**, in astronomy, is the sum of the optic and eccentric equations. The apparent inequality of a planet's motion, arising from its not being equally distant from the earth at all times, is called its optic equation, and this would subsist even if the planet's real motion were uniform. The eccentric inequality is caused by the planet's motion being not uniform.

**ABSOLUTE MOTION, PLACE, SPACE** See the respective substantives

**ABSOLUTE NUMBER** In algebra, that term which is completely known in an equation, and which is equal to the aggregate of

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the rest. *As* in the equation,  $x^2 + 32x - 68 = 0$ , or  $x^2 + 32x = 68$ , the absolute number is 68.

**ABSOLUTELY** *ad* (from *absolute*) 1 Completely, without restriction (*Sidney*) 2 Without relation (*Hook*) 3 Without limits or dependence (*Dryd*) 4 Without condition (*Hook*) 5 Peremptorily, positively (*Milt*)

**ABSOLUTENESS** *s* (from *absolute*) 1 Completeness 2 Freedom from dependence, or limits (*Clar*) 3 Despotism (*Bac*)

**ABSOLUTION** In civil law, is a sentence whereby the party accused is declared innocent of the crime laid to his charge.

**ABSOLUTION**, in the canon law, is a juridical act, whereby the priest declares the sins of such as are penitent remitted. The Romanists hold absolution a part of the sacrament of penance.

**ABSOLUTION** is chiefly used among Protestants for a sentence whereby a person who stands excommunicated is released or freed from that punishment.

**ABSOLUTORY** *a* (*absolutorius*, Lat) That does absolve.

**ABSONANT** *a* Contrary to reason.

**ABSONOUS** *a* (*absonus*, Lat) Absurd, contrary to reason (*Glanville*)

**To ABSORB** *v a* (*absorbeo*, Lat preter *absorbi*, part pret *absorbi*, or *absorpti*) 1 To swallow up (*Philips*) 2 To suck up (*Harvey*)

**ABSORBENT FARTHS**, in chemistry, a term formerly used to denote the substances called alkali earths.

**ABSORBENTS**, (*absorbentia*) Calcareous earths, or other medicines which soak up the redundant humours of the body. Also, a system of vessels that absorb and convey fluids from every cavity of the body to the thoracic duct, which is their common trunk. These last are likewise denominated *lymphatics*, and those of the smaller intestines, from the milky hue of the fluid in most animals, *lacteals*.

**ABSORBENT**, the swallowing up, sucking up, or imbibing any thing: thus black bodies are said to absorb the rays of light, luxuriant branches, to absorb or waste the nutritious juices which should feed the fruit of trees, &c.

**ABSORPTION**, in the animal economy, is the power whereby the absorbent vessels imbibite.

**ABSORPTION**, in chemistry, that process by which a decrease of bulk is effected in the combination of gaseous substances with other gases, or with liquids or solids, and which unites those substances so intimately with the absorbent, as to destroy their gaseous nature. It is distinguished from *condensation* in these respects: the latter acts by pressure, and the former by combination; condensation merely diminishes the bulk of the gas, while absorption changes its character, and, by uniting it



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with other substances, reduces it to the state of a liquid or a solid

To **ABSTAIN** *v n* (*abstineo*, Lat) To forbear, to deny one's self any gratification

**ABSTINII**, in church history, a name given to such persons as could not partake of the cup of the Eucharist, on account of their natural aversion to wine

**ABSTEMIOUS** *a* (*alstemi*us, Lat) Temperate, sober; abstinent (*Abstinat*)

**ABSTEMIOUSLY** *ad* (from *abstemious*) Temperately, soberly, without indulgence

**ABSTEMIOUSNESS** *s* The quality of being abstemious

**ABSTENTION** *s* (from *abstineo*, Lat) The act of holding off, or restraining

To **ABSTERGE** *v a* (*abstergo*, Lat) To cleanse by wiping

**ABSTERGENT** *a* Cleansing, having a cleansing quality

**ABSTERGENTS** (*abstergentia*) Medical or chirurgical applications that clear away foulnesses from ulcers or abscesses

To **ABTERSE** *v a* (See **ABSTERGE**) To cleanse, to purify not in use (*Brown*)

**ABSTERSION** *s* (*absterio*, Lat) The act of cleansing (*Bacon*)

**ABSTERSIVE** *a* (from *absterge*) That has the quality of absterging or cleansing (*Bacon*)

**ABSTINENCE** may be defined, the habit of refraining from what is either useful, agreeable, or pernicious, and may be divided into general and particular. In the former sense, it may signify a certain privation, when by the senses are mortified and the passions restrained. In the latter, it is confined to the exclusion of certain substances at strict times and seasons, in compliance either with the customs of particular countries, or with religious precepts. There is, also, another case, in which the term abstinence denotes the limitation of any usual indulgence, for the purpose of preserving health, and removing the consequences of excess. In the religious institutions of all countries, we find many regulations on this subject. The Mosiac law forbids the eating of animals that were strangled, the use of swine's flesh, the exercise of duty labour on the Sabbath, &c. The Christ in system more particularly enjoins the discipline of the passions, and in abstinence from those pleasures which have a tendency to degrade our nature. In England, particular days have been appointed, called *vails* and *fasts*, in which flesh is prohibited, and fish enjoined; the former, however, being more a political restriction than a religious obligation, was first enacted by the reign of queen Elizabeth, with a view to encourage our fisheries. Of the brute animals, many are remarkable for their long abstinence from food, such as the serpent, the rattlesnake, tortoise, bear, dormouse, elephant, &c. In insects may also be found of men who have been abstemious to a degree

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almost incredible, and experience has demonstrated that, from habit and use, the power of abstinence may be either increased or diminished. Some persons will bear the attacks of hunger without any visible marks of impatience, while in others, a mere temporary privation will occasion the most urgent and distressing symptoms

**ABSTINENT** *a* (*abstinens*, Lat) That uses abstinence

**ABSTINENTS**, or **ABSTINENTES**, a set of heretics that opposed marriage, condemned the use of flesh meat, and placed the Holy Ghost in the class of created beings

To **ABSTRACT** *v a* (*abstraho*, Lat) 1 To take one thing from another 2 To separate ideas (*Locke*) 3 To reduce to an epitome (*Watts*)

**ABSTRACT** *a* (*abstractus*, Lat) Separated from something else generally used with relation to mental perceptions, as, *abstract mathematics* (*Wilkins*)

**ABSTRACT IDEA**, in metaphysics, is a partial idea of a complex object, limited to one or more of the component parts or properties, laying aside or abtracting from the rest. See **ABSTRACTION**

**ABSTRACT TERMS**, words that are used to express abstract ideas. Thus beauty, ugliness, &c. are abstract terms

**ABSTRACT MATHEMATICS**, otherwise called **PURE MATHEMATICS**, is that which treats of magnitude or quantity, absolutely and generally considered, without restriction to any species of particular magnitude, such are Arithmetic and Geometry

**ABSTRACT NUMBERS**, are assemblages of units, considered in themselves without denoting any determined particulars. Thus 6 is an abstract number, when not applied to any thing, but if we say 6 feet, 6 becomes a concrete number

**ABSTRACT** *s* (from the verb) 1 A smaller quantity, containing the virtue or power of a greater (*Shaks*) 2 An epitome made by taking out the principal parts (*Hutton*) 3 The state of being abstracted (*Hutton*)

**ABSTRACTED** *p a* (from *abstract*) 1 Separated, disjoined (*Milt*) 2 Refined, purified (*Donne*) 3 Abstruse, difficult 4 Absent of mind

**ABSTRACTEDLY** *ad* With abstraction, simply, apart from all contingent circumstances (*Dryd*)

**ABSTRACTION** *s* (*abstractio*, Lat) 1 The act of abstracting (*Watts*) 2 The state of being abstracted 3 Absence of mind, inattention 4 Disregard of worldly objects (*Pope*)

**ABSTRACTION** in metaphysics, an operation of the mind, whereby we separate things naturally connected or existing together, and form, and consider, ideas of things thus separated. The faculty of abstracting stands directly opposite to that of composition

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**ing** By composition we consider those things together, which in reality are not joined together in one existence. And by abstraction we consider those things separately and apart, which in reality do not exist apart. Abstraction is chiefly employed these three ways — first, when the mind considers any one part of a thing, in some respect distinct from the whole, as a man's arm, without the consideration of the rest of his body. Secondly, when we consider the mode of any substance omitting the substance itself, or when we separately consider several modes which subsist together in one subject. This abstraction the geometers make use of, when they consider the length of a body separately, which they call a line, omitting the consideration of its breadth and depth. Thirdly, it is by abstraction that the mind frames general, or universal ideas; omitting the modes and relations of the particular objects whence they are formed. — Thus, when we would understand a thinking being in general, we gather from our self-consciousness what it is to think, and omitting the consideration of those things which have a peculiar relation to our own mind, or to the human mind, we conceive of a thinking being in general. Ideas framed thus, which are what we properly call abstract ideas, become general representations of all objects of the same kind, and their names applicable to whatever exists conformable to such ideas. — Thus, the colour that we receive from chalk, snow, milk, &c. is a representation of all of that kind, and has a name given it *whiteness*, which signifies the same quality wherever found or imagined. It is thus less difficult, or power of abstracting, according to Mr. Locke, that makes the great difference between man and brutes, for even the latter must be allowed to have some hint of reason, tho' it is really reason in some case, tho' it is not evident as that they have none, but it is only in particular ideas. They are tied up to the narrow bounds, and do not seem to have any faculty of enlarging them by abstraction. (I say on *Human Understanding*, lib. ii. cap. ii. lib. iii. cap. 3.) Such is the doctrine of abstract ideas, under the improvements of that excellent author. — In effect it is the standing opinion, that the mind has such a power or faculty of forming abstract ideas or notions of things, and on such very ideas do a great part of the writings of philosophers turn. These are supposed in all their systems, and without them there would be nothing done. — They are more especially reputed the object of logic, mathematics, and metaphysics, and all that passes under the notion of the most abstracted and sublime learning.

**Abstracting**, on the common system, is no more than generalising. It is making one thing stand for an hundred, by omitting the consideration of the differences between them. — **Abstracting** several different, i. e. different

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combinations, setting aside the peculiarities in each, and considering only what is found alike in all. — Thus it is that I say, I love my friend, love my mistress, love myself, my bottle, my book, my case, &c. — Not that it is possible I should have the same perception with respect to so many different sorts of things, tho' I find in such different relations to me, but only that there appears something in them all that it bears a resemblance to the rest, in some circumstance or other, I choose to express all by one name *love*. For if I consider the tendency and effect of them all, I shall find they lead me very different ways, to very different actions, and the analogy there is between them, is a sort of pleasure or satisfaction, arising upon the application of the particular object to its proper organ or sense. The abstract idea of love, then, will terminate in the idea of pleasure, but it is certain there can be no ideas of pleasure, without a thing, pleasant to excite it. Any other abstract idea of pleasure, will amount to no more than a view or perception of the circumstances wherewith our pleasures have been attended, but these are mere external forces, to the pleasurable sensation itself, which nothing but an object applied in such and such a manner can excite. To suppose an idea of pleasure produced indirectly, by any other than the proper cause, is as absurd as to suppose an idea of sound produced without a sonorous object. The mind has no power of making any ideas, call them what you will, whether abstract or concrete, of general, or particular, its activity goes no further than to the perceiving, of such as are presented to it, so that its action is really no other than a degree of passion.

**ABSTRACTION** in chemistry, the act of separating, by heat, one part of a compound from the other. In the abstracted part be collected, the process becomes distillation, if not, it is the same with evaporation. The term is, at present, almost entirely confined to the repeated distillation of nitrous acid of any substance, which is then said to have been abstracted *with* the acid.

**ABSTRACTIOUS SPIRITS** in chemistry are those which are drawn from vegetables without fermentation.

**ABSTRACTIVE** *a* (from *abstract*) Having the power or quality of abstracting.

**ABSTRACTIVELY** *ad* (from *abstract*) In an abstract manner, absolutely. (*Bent*)

**ABSTRACTNESS** *s* (from *abstract*) Subtlety, separation from all matter or common notions. (*Locke*)

**ABTRUSE** *a* (*abstrusus*, *Lat*) 1 Hidden. (*Milt*) 2 Difficult; remote from conception or apprehension. (*Milt*)

**ABTRUSELY** *ad*, Obscurely, not plainly, or obviously.

**ABTRUSENESS** *s* (from *abstruse*) Difficulty; obscurity. (*Boyle*)

## A B U

**ABSTRUSITY** *s* (from *abstruse*) 1 **Abstruseness**, 2 That which is abstruse (*Blount*)

**To ABSUME** *v a* (*absumo*, Lat) **To bring to an end by gradual waste** (*Mallet*)

**ABSURD** *a* (*absurdus*, Lat) 1 **Unreasonable**, without judgment (*Bacon*) 2 **Inconsistent**, contrary to reason (*South*)

**ABSURDITY** *s* (from *absurd*) 1 **The quality of being absurd** (*Locke*) 2 **That which is absurd** (*Ald*)

**ABSURDLY** *ad* (from *absurd*) **Improperly**; unreasonably (*Swift*)

**ABSURDNESS** *s* **The quality of being absurd**; unjudiciousness, impropriety

**Reductio ad ABSURDUM** among logicians and mathematicians, a method of proving the truth of a proposition, by shewing that the contrary is absurd. Thus in the 11th and 12th propositions of Euclid's third book this kind of proof is adopted to shew that if two circles touch one another, either externally or internally, the straight line which joins their centres, or that line produced, shall pass through the point of contact for Euclid shews, that on any other supposition than that stated in the proposition, it would follow that one line would be both greater and less than another at the same time *whence it is evident*

**ABHIMANS**, a title of honour used by the ancient inhabitants of Scotland, who called their nobles *Phanes*, which in the old Saxon signifies *high ministers* of these the higher rank were styled *Phanes* the lower *Under-thane*

**ABUNDANCE** *s* (*abundantia*, Lat) 1 **Plenty** (*Chaucer*) 2 **Great numbers** (*Ald*) 3 **A great quantity** (*Mallet*) 4 **Exuberance**, more than enough (*Spenser*)

**ABUNDANCE** *a* (*abundans*, Lat) 1 **Plentiful** (*Mallet*) 2 **Exuberant** (*Ald*)

**ABUNDANTLY** *ad* (*abundans*, Lat) **Fully stored with** (*Bun*)

**ABUNDANT NUMBER**, in arithmetic, a number which aliquot parts, divided all together, make a sum which is greater than the number itself. Thus 12 is an abundant number, because its aliquot parts, namely 1, 2, 3, 4, 6 when added together make 16, which is greater than the number 12 itself

**ABUNDANTLY** *ad* (from *abundant*) 1 **In plenty** (*Gen*) 2 **Amplly**, liberally, more than sufficiently

**To ABUSE** *v a* (*abuso*, Lat) **In abuse** the verb, has the sound of *abuse* in the noun, the common sound 1 **To make ill use of** (*Cor*) 2 **To deceive** to impose upon (*Bacon*) 3 **To treat with rudeness** (*Shakspeare*)

**ABUSE** *s* (from the verb *abuse*) 1 **The ill use of any thing** (*Hooker*) 2 **A corrupt**, bad custom (*Swift*) 3 **Seducement** (*Ald*) 4 **Unjust censur**, rude approach (*Mallet*)

**ABUSER** *s* (pronounced *abuser*) 1 **He that makes an ill use**, 2 **He that deceives** (*Dee*) 3 **He that reproaches with rudeness** 4 **A ravisher**, a violator

## A B Y

**ABUSIVE** *a* (from *abuse*) 1 **Practising abuse** (*Pope*) 2 **Containing abuse** (*Rose*) 3 **Deceitful** (*Bacon*)

**ABUSIVELY** *ad* (from *abuse*) 1 **Improperly**, by a wrong use (*Boyle*) 2 **Reproachfully** (*Herb*)

**To ABUT** *v n* **Obsolete** (*about*, to touch at the end, Fr) **To end at**, to border upon to meet or approach to

**ABUTILLON** of *Tourn* **Indica mallow** See *Sida*

**ABUTILLON OF DILI** and **ELTH** *Carolina mallow* See *Malva*

**ABUTIMENT** *s* (from *abut*) **That which abuts**, or borders upon another

**ABUTTALS** *s* Among lawyers, the buttings, or boundings of a piece of land In Coke the plaintiff is said to "fail in his abuttal," i. e. in shewing how the land is bounded

**ABYDOS**, a town and castle of Natolia, in Lesser Asia Here the streight, which is called Gallipoli, and which divides Europe from Asia, is two miles over All ships coming out of the Archipelago are searched here Lat 40 16 N Lon 37 36 E

**ABYLA**, one of Hercules's pillars on the African side, over against Calpe in Spain, the other pillar

**ABYSS** *s* (*abyssus*, old Fr) **A gulf the same with abyss** (*Shakspeare*)

**ABYSS** *s* (*abyssus* Lat *abysus*, bottomless, Gr) 1 **A depth without bottom** (*Milt*) 2 **A great depth** (*Dry*) 3 **That in which any thing is lost** (*Locke*) 4 **The body of waters supposed at the centre of the earth** (*Bur*) 5 **In the language of divines**, hell (*Rose*) In the fourth sense above, the existence of an abyss, or receptacle of subterraneous water, is controverted by Camerarius, but warmly defended by Dr Woodward Its existence is however, in our opinion far from demonstrated and it appears in some respects inconsistent with sound philosophy

**ABYSS** is also used in heraldry A thing is said to be born in abyss, *en abyssus*, when placed in the middle of the shield, clear from any other bearing

**ABYSS**, in iniquity, the name given to the temple of Proserpine

**ABYSSINIA**, called also **HIGHHER ETHIOPIA**, and by the Arabians **AL HABASH**, is bounded on the north by Nubia, on the east by the Arabian gulf, on the Red sea, and the kingdom of Adal; on the south by the kingdoms of Ajan, Alaba, and Gingiro; and on the west by the kingdom of Goram, and part of Gingiro In this country the famous ever Nile has its source On the mountains the air is pretty temperate, therefore their towns and fortresses are generally placed on them, but in the valleys the heat is intense The torrents of water in the rainy seasons wash a great deal of gold from the mountains These seasons commence in May, and end in September

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tember The inhabitants of this country, in general, are of an olive complexion, tall, graceful, and well featured. Their language is the *Ethiopia*, which bears a great affinity to the Arabic. Gold, silver, copper, and iron, are the principal ores which abound there, but not above one-third part of their gold is converted into money, or used in trade.

**ABYSSINIAN** is used as the name of a sect, in the Christian church, established in the empire of Abyssinia. The Abyssinians are a branch of the Copts, or Jacobites, with whom they agree in admitting only one nature in Jesus Christ, and rejecting the council of Chalcedon whence they are also called Monophysites, and Eutychians. The Abyssinian church is governed by a bishop, or metropolitan, styled *abuna*, sent them by the Coptic patriarch of Alexandria residing at Cairo, who is the only person that ordains priests. They have canons also, and monks, the former of whom marry, the latter at their admission vow celibacy, but with a reservation. Le Grand says, they make a promise aloud before their superior, to keep chastity, but add in a low voice, *as you keep it*. The emperor has a kind of supremacy in ecclesiastical matters. They have at least as many miracles, and legends of saints, as the Roman church, which proved no small embarrassment to the Jesuit missionaries, to whom they produced so many miracles, wrought by their saints, in proof of their religion, and those so well circumstantiated and attested, that the Jesuits were obliged to deny miracles to be any proof of a true religion, and in proof hereof to allege the same arguments against the Abyssinians, which protestants in Europe allege against the papists. Ludolf allows that they believe the real presence after the Lutheran manner, but denies that they hold transubstantiation, though Remondot asserts, that they maintain it. They play for the dead, and invoke saints and angels, have so great veneration for the Virgin, that they charged the Jesuits with not rendering her honour enough. Images in painting they venerate, but abhor all those in relief, except the cross. They hold that the soul of man is not created, because, say they, God finished all his work on the sixth day. They admit the apocryphal books, and the canons of the apostles, as well as the apostolical constitution, for genuine. Their history is given by Alvarez, and in English by Smart, their calendar by Ludolf.

**ACACIA** (*acacia*, from *ακαζα*, to sharpen.) A name given to various species of the *MIMOSA*, which are Of the species that have been employed in medicine, the following are the chief 1 *Acacia germanica*, or *acacia nostras*. *Prunus sylvestris*, *Prunus spinosa* of Linnæus. The wood or wild sloe. The inspissated juice of this fruit was once a favourite rob. 2 *Acacia vera*, *Mimosa nilotica* of Linnæus. The juice of this was employed

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like that of the *acacia germanica*. They both possess stringing virtues, and were formerly esteemed in dysenteries, and diarrheas, from relaxation of the intestine canal. The list is the gum-arabic tree, *Acacia Zeylandica*, the tamarind tree, *Acacia Zeylandica*, lignum catharticum or log wood.

**ACACIA**, false. See **ROBINIA**.

**ACACIA**, German. See **PRUNUS**.

**ACACIA**, three thorned. See **GLADISTIA**.

**ACACIA**, among antiquaries, so called resembling a roll or bag, seen on medals, as in the hands of consuls, emperors, &c.

**ACACIANS**, in church history, the followers of Acacius, bishop of Caesarea who flourished about the middle of the fourth century. Some of them maintained, that the Son was not of the same, but of a similar substance with the Father others held that he was of a different substance from the Father. This was likewise the denomination of another sect, derived from the name of their leader, a patriarch of Constantinople, in the fifth century, who favoured the opinion of Eutyches. See **EUTYCHIAN**.

**ACADEMIA MUSICALIS** (Ital musical academy) A term long since applied, by the Italians, to certain musical meetings, held under a directing leader, for the purpose of amusement and practical improvement. The earliest *academia musicale* of which we have any account was instituted at Vicenza, about the year 1500, and called the *Academia degli Istarmoni*. An academy of music was instituted at Paris in the year 1669. In England the first institution of this kind took place in the year 1710 at the Crown and Anchor Tavern Strand. And in 1720 there was formed, by subscription, the **ACADEMY ROYAL OF MUSICIANS** under the patronage of king George the First.

**ACADEMIAL** *a* (from *academy*) Relating to an academy.

**ACADEMIAN** *s* (from *academy*) A scholar of an academy or university (*Hood*).

**ACADEMICAL** *a* (*academical*, *It*) Belonging to an university (*Holton*).

**ACADEMICIAN** *s* (*academicien*, *Fr*) The member of an academy.

**ACADEMIC'S**, a sect of philosophers, who followed the doctrine of Socrates and Plato, as to the uncertainty of knowledge, and the incomprehensibility of truth. *Academus*, in this sense, amounts to much the same with Platonist, the difference between them being only in point of time. They who embraced the system of Plato, among the ancients, were called *academics*, whereas those who did the same since the restoration of learning, have assumed the denomination of *Platonists*. We usually reckon three sects of academics, though some make five. The ancient academy was that whereof Plato was the chief. (See **PLATONISM**) Arcesilas, one of his successors introducing some alterations into the philosophy

# ACADEMY.

phy of this sect, founded what they call the second academy. The establishment of the third, called also the *new academy*, is attributed to Lacydes, or rather to Carneades. Some authors add a fourth, founded by Philo, and a fifth by Antiochus, called the *Antiochan*, which tempered the ancient academy with Stoicism. Before the days of Plato, philosophy had in a great measure fallen into contempt. The contradictory systems and hypotheses which had successfully been urged upon the world were become too numerous, that, from a view of this inconsistency and uncertainty of human opinions, many were led to conclude that truth lay beyond the reach of our comprehension. Absolute and universal scepticism was the natural consequence of this conclusion. In order to remedy this abuse of philosophy and of the human faculties, Plato laid hold of and refuted the principles of the academical philosophy. Of the sceptics of our own country, Berkeley and Hume are the most considerable. Berkeley denied the existence of every thing excepting his own ideas. Mr Hume has gone a step further, and questioned even the existence of ideas, but at the same time has not hesitated to give determined opinions with regard to eternity, Providence, and a future state, miraculous intipositions of the Deity, &c. subjects far above the reach of our faculties. In his essay on the academical or sceptical philosophy, he has founded two very opposite species of philosophy. After the days of Plato, indeed, the principles of the first academy were grossly corrupted by Arcesilus, Carneade, &c. This might lead Mr Hume into the notion that the academical or sceptical philosophy were synonymous terms. But no principles can be of a more opposite nature than those which were inculcated by the old academy of Socrates and Plato, and the sceptical notion which were propagated by Arcesilus, Carneades, and the other disciples of the succeeding academy.

ACADEMIES in a larger sense, is applied to the members of an academy, or of a college.

ACADEMIST This means ACADEMIC or ACADEMICIAN.

ACADEMUS or ACADEMUS in Athenian citizen, whose house and garden were employed as a philosophical school, in the time of Theseus, he had the honor of giving a name to a sect of philosophers, or rather three sects, called *Academies*.

ACADEMY, in antiquity a garden, villa, or grove, near Athens, where the philosophers delivered their instructions, and their followers held their conferences. The name academy is taken from Academus, the original owner of the ground, who lived in the time of Theseus. The academical gardens occupied a surface somewhat exceeding a mile square, in the environs of Athens, and extended from the banks of the Ilissus to those of the Cephissus. The

centre belonged to the disciples of Epicurus, southwards were those of Aristotle, and northwards the followers of Plato to whose garden the term academy has been generally confined. Each sect was distinguished by peculiar manners and characteristics, yet never did sects discover less turbulence, or neighbours fewer jealousies in alley of olive-tree, or a thicket of myrtles, separated the dominions of systems, and served as boundaries to the empire of opinions. The philosophers retained these possessions until Greece fell under the yoke of the Roman Catholics at the unusual sight of priests and monks armed with axes and torches, philosophy abandoned the regions of Greece, and that reign of darkness succeeded, which still continues there.

ACADEMY, among the moderns, denotes a regular society or company of learned persons, instituted under the protection of some prince, or other public authority, for the cultivation and improvement of arts or sciences. Some authors confound academy with university, but though much the same in Latin, they are very different things in English. An university is properly a body composed of graduates in the several faculties, of professors who teach in the public schools, of regents, or tutors, and students who learn under them, and aspire likewise to degrees. Whereas an academy is not intended to teach or profess any art or science, but to improve it: it is not for novices to be instructed in, but for those that are more knowing, for persons of learning to confer in, and communicate their lights and discourse to each other, for their mutual benefit and improvement.

The first modern academy we read of, was established by Charles IX, by the name of *Academ* in English mould. It was composed of the chief gentlemen of the court, the emperor himself being a member. In their academical conferences, every person was to give some account of the ancient authors he had read, and each one retained the name of some ancient author that pleased him most, or some celebrated person of antiquity. *Academ*, from whose letters we learn these particulars, took that of *Flecius*, the surname of *Honace*, a young lord, named *Augilbert*, took that of *Honor*, *Adrian*, bishop of *Corbie*, was called *Augustin*; *Recluse*, bishop of *Mentz*, was *Dunctus*, and the king himself *David*. Most nations have now their academies, but Italy has by far the greatest number. The French have many flourishing academies, most of which were established by *Louis XIV*. We have but few in Britain, and those of the chiefest note go by a different name. There are, however, in London, the Academy of Painting, and that of Music, established by letters-patent, and governed by their respective directors. In giving an account of the principal academies, it seems most proper to arrange them according to their subjects.

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**I Medical Academies**, as that of the *Naturæ Curiosæ* in Germany, that founded at Palermo in 1645, another at Venice in 1701, which meets weekly in a hall near the grand hospital, another at Geneva in 1713, in the house of M. Le Clerc. The colleges of physicians at London and Edinburgh are also, by some, ranked in the number of academies (See COLLEGE.) The academy of *Naturæ Curiosæ*, called also the Leopoldine academy, was founded in 1652, by Jo. Laur. B. in chiu, a physician who, in imitation of the English, published in invitation to all physicians to communicate their extraordinary cases, and, meeting with success, was elected president. Their works were at first published separately, but in 1670 a new scheme was laid for publishing a volume of observations every year. The first volume appeared in the year 1684, under the title of *Iphimendes*, and the work has been continued with some interruptions and variations of the title, &c. In 1687, the emperor Leopold took the society under his protection, granting the members several privileges, particularly that their presidents should be counsellors of the holy Roman empire. This academy has no fixed residence or regular assemblies: instead of these, there is a kind of bureau, or office, first established at Br. lin, and afterwards removed to Nuremberg, where letters, observations, &c. from correspondents or members are taken in. The academy consists of a president, two adjuncts or secretaries, and collectors or members without restriction. The colleague, at their admission, obliges themselves to two things: first, to choose some object out of the mineral, vegetable or animal kingdom, to handle, provided it had not been treated of by any colleague before; the second to supply themselves to furnish materials for the annual *Iphimendes*. Each member bears a symbol of the academy viz. a gold ring, with on instead of a stone is a book open, and, on the face thereof, in case on the other side is inscribed the academy *Virgiana* of verse.

**II Chirurgical Academies**, as that instituted some years ago, by public authority, at Paris: the members of which were not only to publish their own and correspondents observations and improvements, but to give an account of all that is published on surgery, and to compose a complete history of the art, by their extracts from all the authors, in ancient and modern, who have wrote on it. A question in surgery is usually proposed by the academy, and a gold medal of two hundred livres value given to him who furnishes the most satisfactory answer.

**III Ecclesiastical Academies**, as that at Bologna in Italy instituted in 1687, employed in the examination of the doctrine, discipline, and history of each age of the church.

**IV Geographical Academies**, as that

at Venice, called the *Argonautæ*. This was instituted at the solicitation of F. Coronelli, for the improvement of geographical knowledge. Its design was to publish exact maps, both celestial and terrestrial, as well particular as general, together with geographical, historical, and astronomical descriptions. Each member in order to defray the expence of such a publication was to subscribe a proportional sum, for which they were to receive one or more copies of each piece published. For this end, three societies are settled, one under F. Moro, provincial of the Minorites in Hungary, another under the abbot Laurence, at Rine Pyrene in Marais, the third under F. Biddesim, jesuit professor of mathematics in the Roman college. The device of this academy is the terraqueous globe, with the motto *Plus ultra*, and at its expence all the globes, maps and geographical writings, of F. Coronelli have been published.

**V Academies of Sciences**. These comprehend such as are erected for improving natural and mathematical knowledge. They are otherwise called *Philosophical* and *Physic* Academies. The first of these was instituted at Naples, about the year 1600 in the house of Baptist. Pont. It was called the Academy *Secretorum in Natura*, and was succeeded by the Academy of *Linceæ*, founded at Rome by Prince Frederic Cesi towards the end of that century. Several of the members of this academy rendered it famous by their discoveries, among these was the celebrated Galileo. Several other academies were instituted about that time, which contributed greatly to the advancement of the sciences, but none of them comparable to that of the *Linceæ*. Some years after the death of Torricelli, the Academy del *Cris* to made its appearance under the protection of prince Leopold, afterwards cardinal de Medici. Reading is one of its chief meetings, and the studies pursued by the rest may be collected from those curious experiments published in 1667, by their secretary count Luince Maculotti, under the title of *Saggi di Naturali Esperienze*, a copy of which was presented to the Royal Society, translated into English by Mr. Waller, and published at London in quarto.

The Academy del *Inquith* afterwards incorporated into that of Dello *Fuoco* in the same city, followed the example of that of Del *Cimento*. Some excellent discourses on physical and mathematical subjects, by Gemmino Montenari, one of the chief members, was published in 1667 under the title of *Pensieri Fisico Matematici*.

The Academy of *Rossano*, in the kingdom of Naples, was originally an academy of Belles Lettres, founded in 1640, and transformed into an Academy of Sciences in 1695, at the solicitation of the learned abbot, Don Giacinto Giummi, who being made president, under the title of Promoter General thereof,

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gave them a new set of regulations. He divided the academists into the following classes: grammarians, rhetoricians, poets, historians, philosophers, physicians, mathematicians, lawyers, and divines, with a class apart for cardinals and persons of quality. Several other academies of sciences have been founded in Italy, but, for want of being supported by princes, did not continue long. The loss of them, however, was abundantly repaid by the institution of others still subsisting, such as, the *academy of Philharmony* at Verona, of *Republique* at Padua, where a learned discourse on the origin of springs was delivered by sig. Vallisneri, first professor of physic in the university of that city, and which was afterwards printed. To the academy of the *Musi de Regio*, at Modena, the same sig. Vallisneri presented an excellent discourse on the scale of created beings, since inserted in his history of the generation of man and animals printed at Venice in the year 1721. F. Mersenne is said to have given the first idea of a philosophical academy in France, towards the beginning of the seventeenth century, by the conferences of naturalists and mathematicians occasionally held at his lodgings, at which Gassendi, Des Cartes, Hobbes, Roberval, Pascal, Blondel, and others, assisted. F. Mersenne proposed to each certain problems to examine, or certain experiments to be made. These private assemblies were succeeded by more public ones, formed by Mr. Montmort, and Mr. Thevenot, the celebrated traveller. The French example animated several Englishmen of distinction and learning to erect a kind of philosophical academy at Oxford, towards the close of Oliver Cromwell's administration, which, after the Restoration, was erected into a Royal Society. (See SOCIETY.) The English example, in its turn, animated the French. Lewis XIV. in 1666, assisted by the council of Mr. Colbert, founded an academy of Sciences at Paris, with a sufficient revenue to defray the charge of experiments, and salaries to the members.

*Royal Academy of Sciences.*—After the peace of the Pyrenees, Lewis XIV. being desirous of establishing the arts, sciences, and literature, upon a solid foundation, directed M. Colbert to form a society of men of known abilities and experience in the different branches, who should meet together under the king's protection, and communicate their respective discoveries. Accordingly Mr. Colbert, having conferred with those who were at that time most celebrated for their learning, resolved to form a society of such persons as were conversant in natural philosophy and mathematics, to join to them other persons skilled in history and other branches of erudition, along with those who were entirely engaged in what are called the *Belles Lettres*, grammar, eloquence, and poetry. All the different classes were ordered to meet together upon the first

Thursday of every month, and, by their respective secretaries, make a report of the proceedings of the foregoing month. In a short time, however, the classes of History, *Belles Lettres*, &c. were united to the French Academy, which was originally instituted for the improvement and refining the French language, so that the Royal Academy contained only two classes, viz. that of natural philosophy and mathematics. In the year 1669 the king, by a proclamation dated the 26th of January, gave this academy a new form, and put it upon a more respectable footing.—It was now to be composed of four kinds of members, viz. honorary, pensionary, associates, and élèves. These last were a kind of pupils, or scholars, each of whom was attached to one of the pensionaries. The first class to contain ten persons, and each of the rest twenty. The honorary academists to be all inhabitants of France, the pensionaries all to reside at Paris, eight of the associates allowed to be foreigners, and the élèves all to live at Paris. The officers to be, a president named by the king, out of the class of honorary academists, and a secretary and treasurer, to be perpetual. Of the pensionaries, three to be geometers, three astronomers, three mechanics, three anatomists, three chemists, three botanists, and the remaining two to be secretary and treasurer. Of the twelve associates, two to apply themselves to geometry, two to botany, and two to chemistry. The élèves to apply themselves to the same kind of science with the pensionaries they were attached to, and not to speak, except when called by the president. No regular or religious to be admitted, except into the class of honorary academists, nor any person to be admitted either for associate or pensionary, unless known by some considerable printed work, some machine, or other discovery. To encourage the members to pursue their labours, the king engaged not only to pay the ordinary pensions, but even to give extraordinary gratifications, according to the merit of their respective performances, furnishing withal the expence of the experiments and other enquiries necessary to be made. If any member gave in a bill of charges of experiments he had made, or desired the printing of any book, and brought in the charges of grav- ing, the money was immediately paid by the king, upon the president's allowing and signing the bill. So, if an anatomist required live tortoises, for instance, for making experiments about the heart, &c. as many as he pleased were brought him at the king's charge. Their motto was, *Invenit et perfecit*. In the year 1716, the Duke of Orleans, then regent, made an alteration in their constitution, augmenting the number of honoraries, and of associates capable of being foreigners, to twelve, admitting regulars among such associates, and suppressing the class of élèves, as it appeared to be attended with some inconveni-



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ence, particularly that of making too great an inequality among the academists, and being productive of some misunderstandings and animosities among the members. At the same time he created other two classes, one consisting of twelve adjuncts, who, as well as the associates, were allowed a deliberative voice in matters relative to science, and the other six free associates, who were not attached to any particular science, nor obliged to pursue any particular work. After its re-establishment in 1699, this academy was very exact in publishing, every year, a volume containing either the works of its own members, or such memoirs as had been composed and read to the academy during the course of that year. To each volume is prefixed the history of the academy, or an extract of the memoirs, and, in general, of whatever has been read or said in the academy, at the end of the history, are the eulogiums on such academists as have died that year—M Rouille de Meslay, counsellor to the parliament of Paris, founded two prizes, one of two thousand five hundred, and the other of two thousand livres, which are alternately distributed by the parliament every year, the subject for the first must relate to physical astronomy, and those for the latter to navigation and commerce. Notwithstanding the advantages which the members of this academy enjoyed over others, in having their expenses defrayed, and even being paid for their time and attendance, they have fallen under one imputation, particularly that of plagiarism. The French revolution, however, occasioned this Academy to be new modelled.

## see INSTITUTE

The *Royal Society at Berlin* was founded in 1700, by Frederic II king of Prussia, on the model of that of England, excepting that, besides natural knowledge, it likewise comprehends the *Belles Lettres*. In 1710 it was ordained that the president shall be one of the counsellors of state, and nominated by the king. The members were divided into four classes, the first for prosecuting physics, medicine, and chemistry; and the second for mathematics, astronomy, and mechanics, the third for the German language and the history of the country, the fourth for oriental learning, particularly as it may concern the propagation of the gospel among infidels. Each class to elect a director for themselves, who shall hold his post for life. The members of any of the classes have free admission into the assemblies of any of the rest. The great promoter of this institution was the celebrated Mr Leibnitz, who accordingly was made the first director. The first volume of their *Transactions* was published in 1710, under the title of *Miscellanea Berolinensia*. Frederic III the late king of Prussia, gave new vigour to this academy, by inviting to Berlin such foreigners as were most distinguished for their merit in literature, and encouraged his subjects

to prosecute the study and cultivation of the sciences by giving ample rewards, and thinking that the academy, which till that time had had some minister or opulent nobleman for its president, would find an advantage in having a man of letters at its head, he conferred that honour on M Maupertius. At the same time, he gave a new regulation to the academy, and took upon himself the title of its protector.

The *Imperial Academy at Petersburg* was projected by Czar Peter the Great, who had taken the necessary measures for its establishment, when he was prevented by death from putting them into execution. His successor, the Czarina Catherine, laboured on the same plan; and in a short time formed one of the most celebrated academies in Europe, composed of the most considerable foreigners, some of them settled at Petersburg. The memoirs of this academy, which are published in Latin, are highly valuable, particularly for the mathematical part. The academy, however, was in a very languishing condition, when the Empress Czarina Elizabeth ascended the throne, but that princess, happily, naming Count Rasomowski president, he gave it a new body of statutes and quickly restored it to its ancient splendour. The building and apparatus of this academy are extraordinary there being a fine library, observatory, &c. It partakes much of what we call a University, having regular professors in the several faculties who read lectures as in our schools. The ordinary assemblies are held twice a-week, and public or solemn ones thrice a-year. In the public assemblies an account is given of what has been done in the private ones. The academy has this modest motto "*Paulatim*."

The *Academy of Sciences*, called the *Institute of Bologna*, was founded by count Marsigli in 1712, for the cultivating of physics, mathematics, medicine, chemistry, and natural history. Its history is written by M de Limiers, from memoirs furnished by the founder himself.

*American Academy of Arts and Sciences*, was established in 1780 by the council and house of representatives in the province of Massachusetts Bay for promoting the knowledge of the antiquities of America, and of the natural history of the country, for determining the uses to which its various natural productions may be applied, for encouraging medicinal discoveries, mathematical disquisitions, philosophical enquiries and experiments, astronomical, meteorological, and geographical observations, and improvements in agriculture, manufacture, and commerce; and, in short, for cultivating every art and science, which may tend to advance the interest, honour, dignity, and happiness of a free, independent, and virtuous people. The members of this academy are never to be less than forty, nor more than two hundred.



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**VI Academies of Law**, as that famous one at Beryta, and that of the Sicuties at Bologna

**VII Academies of History**, as the *Royal Academy of Portuguese History* at Lisbon. This academy was instituted by King John V in 1720. It consists of a director, four censors, a secretary and fifty members, to each of which is assigned some part of the ecclesiastical or civil history of the nation, which he is to treat either in Latin or Portuguese. In the church-history of each diocese, the prelates, synods, councils, churches, monasteries, academies, persons illustrious for sanctity or learning, places famous for miracles or relics, must be distinctly related in twelve chapters. The civil history comprises the transactions of the kingdom from the government of the Romans down to the present time. The members who reside in the country are obliged to make collections and extracts out of all the registers, &c. where they live. Their meetings to be on one in fifteen days. A medal was struck by this academy in honour of their prince, the front of which was inscribed with the inscription *Johannes V. Lusitanorum Rex*, and, on the reverse, the same prince is represented standing, and raising History almost prostrate before him with the legend *Historia Resurgens*. Underneath are the following words in abbreviation: *REGIA ACADEMIA HISTORIAE LUSITANAE INSTITUTA VI Idus Decembris MDCCXX*.

**VIII Academies of Antiquities**, as that at Cortona in Italy and at Upsal in Sweden. The first is designed for the study of Heltrurian antiquities, the other for illustrating the northern languages, and the antiquities of Sweden, in which notable discoveries have been made by it. The head of the Heltrurian Academy is called *Tuconon*, by which the ancient governors of the country were distinguished. One of them lays to give audience to poets only one day in the year, another is to fix their sessions and impose a tax of a disertation on each member in his turn.

The *Academy of Medals and Inscriptions* at Paris was set on foot by M. Colbert under the patronage of Lewis XIV. in 1666 for the study and explanation of ancient monuments, and perpetuating great and memorable events, especially those of the French monarchy, by coins, relieves, inscriptions, &c. The number of members at first was confined to four or five, chosen out of those of the French Academy, who met in the library of M. Colbert, from whom they received his majesty's orders. By a new regulation, dated the 16th of July, 1704, the academy was composed of ten honorary members, ten associates, each of whom had two declarative voices, ten pensionaries; and ten elves, or pupils. They then met every Tuesday and Wednesday, in one of the halls of the Louvre, and had two public meetings yearly, one the

day after Martinmas and the other the sixteenth after Easter. The class of elves has been suppressed, and united to the associates. The king nominates their president and vice-president yearly, but their secretary and treasurer are perpetual. The rest are chosen by the members themselves, agreeably to the constitutions on that behalf given them.

**IX Academies of Belles Lettres**, are those wherein eloquence and poetry are chiefly cultivated. They are very numerous in Italy, and not uncommon in other countries.

The *Academy of Umidi* at Florence has contributed greatly to the progress of the sciences by the excellent institutions given by some of its members, of the ancient Greek and Latin history. Their chief attention is to the Italian poetry, at the same time that they have applied themselves to the polishing of that language, which produced the *Ladame La Crusca*.

The *Academy of Humonists* *Funisti*, had its origin at Rome from the marriage of Lorenzo Marini, a Roman gentleman, at which several persons of rank were guests, and, it being almost time to give the ladies some diversion, they betook themselves to the reciting of verses, soon to pieces, first *et tempore*, and afterwards promiscuously, which gave them the denomination of *Belli Humonisti*. After some experience, coming more and more into the taste of these crosses they resolved to form an Academy of Belles Lettres, and changed the title of *Belli Humonisti* for that of *Humonisti*, choosing for their device a cloud which, after being formed of calistations from the salt waters of the ocean, returns in a gentle sweet shower, with this motto from Lucretius, *Reddit agmine dulcis*. In 1690, the *Academy of Arcadi* was established at Rome, for reviving the study of poetry and of the belles lettres. Besides most of the politer wits of both sexes in Italy, this academy comprehends many princes, cardinals, and other ecclesiastics, and to avoid disputes about pre-eminence, all appear masked after the manner of Arcadian shepherds. Within ten years from its first establishment, the number of academists amounted to six hundred. They hold assemblies seven times a year in a mead or grove or in the gardens of some nobleman of distinction. Six of these meetings are employed in the recitation of poems and verses of the Arcadi residing at Rome, who read their own compositions, except ladies and cardinals, who are allowed to employ others. The seventh meeting is set apart for the compositions of foreign or absent members. This academy is governed by a Cusur, who represents the whole society, and as chosen every four years, with a power of electing twelve others yearly for his assistance. Under these are two sub-custodes, one vicar or pro-custos, and four deputies or superintendants, annually chosen. The laws of the society

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are immutable, and bear a near resemblance to the ancient model

X *Academies of Languages*, called, by some, *Grammatical Academies*, &c.

The *Academy della Crusca* at Florence, famous for its vocabulary of the Italian tongue, was formed in 1582, but came head of before the year 1581, when it became noted for a dispute between Tasso and several of its members. Many authors confound this with the Florentine academy. The discourses which Torricelli, the celebrated disciple of Galileo, delivered in the assemblies, concerning levity, the wind, the power of percussion, in mathematics and military architecture, are a proof that the academists applied themselves to things

The *Academy of Tricasteri* had its rise in 1613, as an assembly of several princes and nobles of the country, who met with a design to improve and perfect the German tongue. It continued long, under the direction of princes of the empire, who were always chosen presidents. In 1608 the number of members rose to upwards of nine hundred. It was prior in time to the French academy, which only appeared in 1639, and was not established till an academy for the year 1633. Its history is written in German tongue, by George

The *Academy of Letters* which had its rise in the institution of an academy of letters in the year 1600, in 1609. In 1609 it was set on foot by Cardinal Richelieu for refining and securing the French language and style. The number of its members was limited to forty, out of whom a director, chancellor, and secretary were to be chosen: the two former held their post for two months, the latter perpetual. The members of this academy enjoyed several privileges and immunities, among which was that of not being obliged to answer before any court but that of the king's highness. They met three times a week in the Louvre, at breaking up forty silver medals were distributed among them, having on one side the King of France's head, and on the reverse *Protecteur de l'Académie*, with laurel, and this motto *Immortale*. By this distribution, the attendance of the Academy was secured, those who were present receiving the surplus otherwise intended for the absent. To elect or expel a member at least eight were required, nor could any be elected unless he petitioned for it by the expedient the affront of refusal from persons of rank was avoided. Religious were not admitted, nor could any nobleman or person of distinction be admitted on another's petition as a man of letters. None have been expelled except for bare and dishonest practices, and there are but two instances of such expulsions: the first of M. Granier for refusing to return a deposit, the other of the Abbé Lurieu for

plagiarism. — The design of this academy was to give not only rules, but examples, of good writing. They began with making speeches on subjects taken at pleasure, about twenty of which were printed. They met with great opposition from the parliament at their first institution, it being two years before the patents granted by the king would be registered. They have been severely satyrised, and their style has been ridiculed as enervating instead of refining the French language. They are also charged with having sufficed the world by flattery, and having exhausted all the topics of panegyric in praise of their founder, it having been a duty incumbent on every member at his admission, to make a speech in praise of the king, the cardinal, the chancellor, &c. and the person in whose place he was elected. The most remarkable work of this academy is a dictionary of the French tongue, which, after fifty years spent in settling the words and phrases to be used in writing, was at last published in 1694.

The *Royal Spanish Academy* at Madrid held its first meeting in July 1713, in the palace of its founder, the Duke of Escalona. It consisted at first of eight academists, including the duke, to which number fourteen other were afterwards added, the founder being chosen president or director. In 1714 the king granted them his confirmation and protection. Their device is a crucible in the middle of the fire, with this motto *Limpia, Fuga y da Tipla* — "It purifies, fixes, and gives lightness." The number of members is limited to twenty-four, the duke's scholars to be director for life, but his successors chosen yearly, and the secretary to be perpetual. The object, is marked out by the royal declaration, was to cultivate and improve the national language, they were to begin with choosing carefully words and phrases as have been used by the best Spanish writers, noting the loss, variation, or obsolete ones, and composing a dictionary wherein these may be better guarded from the former.

ACADEMIES abound among several kinds of civil and school education, where youth are instructed in the liberal arts and sciences in a private way, now and then used for a kind of school. Frederick King of Prussia established an academy at Berlin in 1703, for educating the young nobility of the court, suitable to their extraction. The expense of the students was very moderate, the king having undertaken to pay the extraordinary. This illustrious school, which was then called the academy of princes, has now lost much of its first splendour. The Romans had a kind of military academy established in all the cities of Italy under the name of *Campi Martii*. Here the youth were admitted to be trained for war at the public expense. And the Greeks, besides academies of this kind, had military professors, called *tactici*,

who taught all the higher offices of war, &c. We have two royal academies of this kind in England, the expenses of which are defrayed by the government, the one at Woolwich for the artillery and military engineers, and the other at Portsmouth, for the navy. The former was established by his late majesty king George II by v<sup>er</sup>ants dated April the 30th and November 18th, 1741, for instructing persons belonging to the military part of the ordinance, in the several branches of mathematics, fortification, &c. proper to qualify them for the service of artillery, and the office of engineers. This institution is under the direction of the master-general and board of ordinance for the time being, and at first the lectures of the masters in the academy were attended by the practitioner engineers, with the officers, sergeants, corporals, and private men of the artillery, besides the cadets. At present, however, none are educated there but the gentlemen cadets to the number of about two hundred though it is probable a greater number of cadets will soon be received into the institution at one time. The masters have been gradually increased, from two or three at first, now to the number of about twenty, namely, a professor of mathematics, and eight other mathematical masters, a professor of fortification, and two masters, five drawing-masters, with masters for French, chemistry, fencing, and dancing. The master-general of the ordinance is always captain of the cadet company, and governor of the academy under him are a lieutenant governor, an inspector, and an inspector of studies, besides the masters. This institution is of the greatest consequence to the state, though managed at a comparatively trifling expence. As the former situation for the academy and cadets' barracks, in the Warren, was low, polluted, and unhealthy, it was determined to erect them on a more extended and noble scale, in an elevated and healthy situation, by the side of Shooter's hill. The first stone of the new buildings was laid on Friday, May 27th, 1803, by his royal highness the duke of York, and the academy was removed to them on the 12th of August, 1806. The Royal Naval Academy at Portsmouth was founded by George I in 1722, for instructing young gentlemen in navigation and the subsidiary branches, to fit them for offices in the royal navy. The establishment, which is now undergoing some new arrangements, is under the direction of the board of admiralty, who give salaries to various masters, by one of whom the students are at present boarded and lodged; the expence which is defrayed by their own friends, nothing being supplied by the government but their education.

**ACADIE**, or **ACADIA**, a name formerly given to Nova Scotia.

**ACÆNA**, in antiquity, a Grecian decemped, or ten-foot rod, used in measuring their lands

**ACÆVA** In botany, a genus of the *Linnaean* class tetrandria, order monogynia, thus generically characterised calyx, four-leaved, corol, four-petalled, berry dry, inferior, single-seeded, prickly backwards. The only known is *A. elongata*, of Mexico, a plant of at two feet high.

**ACAIOU** In Tournefort's system, the cashew-nut. See **ANACARDIUM**.

**ACALYPHA** In botany, a genus of the Linnaean class 4th order monoccia monadelphica. The generic character of the male blossom is, calyx three or four leaved, corol, none, stamens from eight to sixteen. The character of the female, calyx three leaved, corol none, styles three, capsules three-grained; seeds solitary. There are fourteen species of this plant, collected in the East and West Indies, some of which resemble the broad-leaved pellitory of the wall but few of them have much pretension to beauty or elegance.

**ACALEPTIC** In ancient prosody, a complete verse.

**ACAMANTIS** In geography, the ancient name of the island of Cyprus.

**ACAMAS**, son of Theseus and Phædra, went with Diomedes to demand Helen from the Trojans after her elopement from Menelaus. He was concerned in the Trojan war, and afterwards built the town of Acamantium in Phrygia, and called a tribe after his own name at Athens.

**AC ANACEOUS PLANTS** (from *ανακαθαζω*, thorn or prickle.) Plants surrounded either in their stems or calyxes with thorns or prickles.

**ACANGIS**, (*ravagers*) Turkish husars, or light troops.

**ACANOR** A kind of chemical furnace. See **ATHANOR**.

**ACANTHA**, (from *ακανθα*, a thorn, or prickle.) 1 The thorn, or prickle, of plants. 2 The spines of certain fishes, as of the equinus marinus.

**ACANTHACEOUS** (from *acantha*) A term given to plants which, like the thistle, are beset with prickles. Acanaceous.

**ACANTHÆ** (*ακανθα*, a thorn or prickle.) The prickles of thorny plants.

**ACANTHAS**, a town of Egypt, now *Br-salta*.

**ACANTHIA** In the entomology of Fabricius, a tribe or family of the genus cimex or bug. See **CIMEX**.

**ACANTHINE** Any thing resembling the herb acanthus. Acanthine garments, among the ancients, are said to be made of the down of thistles.

**ACANTHINUM** (*ακανθινον*, from *ακανθα*, a thorn.) Gum arabic which is largely collected from different species of acacias and acanthuses, both of them thorn trees.

**ACANTHOPTERYGIOSUS**, (from *ακανθα*, a thorn, or prickle, and *πτερυγιον*, a fin, or feather.) A term applied to fishes, and em-

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bracing a class or family distinguished by having the rays of their fins bony, or prickly, at the extremities

**ACANTHUS** (*acanthus*, *ακανθος*, from *ακανθα*, a thorn) So named from its rough and prickly surface *Branchia urina*, or bears breech a genus of the Linnéan class and order didynamia, angiospermia, thus characterised calyx two leaved, bifid or cloven, corol one lipped, deflected, three cleft, capsule two celled There are fourteen species of this genus, in Asia, the Cape of Good Hope, and on the southern shores of Europe The leaves and root of the *acanthus mollis foliis sinuatis inermibus* of Linnéus abound with a mucilage, which is readily extracted by boiling or infusion The roots are most innocuous Where this plant is common it is employed for the same purposes to which althæa and other vegetables possessing similar qualities are applied among us It is fallen into disuse

**ACANTHUS**, in architecture, an ornament representing the leaves of the acanthus, used in the capitals of the corinthian and composite orders

**ACANTHUS MOLLIS** The systematic name for the *acanthus* See **ACANTHUS**

**ACAPULCO**, a town of Mexico, in North America, situated on a fine bay of the South sea When the galleons arrive at this place, traders flock from every part of Mexico, who come to exchange European toys, their own cochineal, and about 437,000*l* sterling for spices, muslins, printed linens, silks, perfumes, and the gold works of Asia Lat 17 30 N Lon 105 29 W

**ACARNA** A genus of thistles in the Linnæan system, arranged in the class and order syngenesia æqualis, and thus characterised receptacle chaffy, down feathery, calyx imbricate, invested with scales, corol floscular There are seven species, many of which, from their general resemblance to the *carduus leucodictus*, or blessed thistle, have been improperly co-founded with it It is a native of Spain and the Barbary coasts, and has been also found in Japan

**ACARUS**, Tick In zoology, a genus of the Linnæan class insectæ, order aptera, mouth without proboscis, the sucker with a cylindrical bivalved sheath, feelers two, compressed, and as long as the sucker, eyes two, placed on the sides of the head, legs eight Its species and varieties are very numerous, and include all those which in our own language are denominated *tick* or *mite* the itch insect is one of its species

**ACASTUS**, son of Pelias, king of Thessaly, married Astrydamia or Hyppolyte, who fell in love with Peleus, son of Æacus, when in banishment at her husband's court Pelus rejecting the addresses of Hyppolyte, was accused before Acastus of attentions upon her

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virtue, and soon after, at a chace, exposed to wild beasts Vulcan, by order of Jupiter, delivered Peleus, who returned to Thessaly, and put to death Acastus and his wife

**ACATALECTIC**, **ACATALECTICUS**, in the ancient poetry, a term applicable to such verses as have all their feet and syllables, and are in no wise lame or defective at the end The word comes from *κατα*, and *ληγω*, to cease or end, whence *καταληπτικός*, which wants something at the end

**ACATALEPSIA**, **ACATALEPSY**, in philosophy, an impossibility of a thing's being conceived or comprehended The word is compounded, of the private *α*, and *καταλαμβάνω*, *deprehendo*, to find out

**ACATAPOSIS** (*ακαταποσις*, from *α*, neg and *καταπινα*, to swallow) Difficulty of deglutition Dysphagia

**ACATHARSIA** (*ακαθαρσία*, from *α*, neg and *καθαίρω*, to purge) The gross and impure humours that remain uncarried off in the body

**ACATHISTUS**, a solemn hymn anciently sung in the Greek church on the Saturday of the fifth week of Lent, in honour of the Virgin

**ACATIUM** in the ancient navigation, a kind of privateer, or private sloop, wrought with oars

**ACAULIS** (from *α*, neg and *καλος*, a stalk) A botanic term applied to herbs that have no stem, and rest their corols on the ground Stalkless, stemless

**ACAULOSI**, **ACAULOUS** (*acaulosus*, from *α*, neg and *καλο*, a caulis or stem) A term descriptive of plants that possess no stem

**ACCA LAURENTIA**, the wife of Faustulus, shepherd of king Numitor's flocks She brought up Romulus and Remus, who had been exposed on the banks of the Tiber From her wantonness, she was called Lupa (a prostitute, whence the fable that Romulus was suckled by a she wolf) *Dionys Hal Lu* — Another prostitute, in honour of whom certain annual festivals, called *Laurentia*, were celebrated by the Romans

**ACCAPITARI**, in law, the act of becoming vassal of a lord, or of yielding him homage and obedience Hence,

**ACCAPITUM**, signifies the money paid by a vassal upon his admission to a feud It likewise, in our ancient law, was used to express the relief due to the chief lord See **RELIEF**

**ACCEDAS AD CURIAM**, in the English law, a writ lying, where a man has received, or fears, false judgment in an inferior court It lies also for justice delayed, and is a species of the writ *Recordari*

To **ACCEDE** *v n* (*accedo*, Lat) To be added to, to come to

**ACCELERANDO**, in music, an Italian

# ACCELERATION

term for accelerating the time in the middle of a piece of music, as *alantando* is for retarding it

To ACCELERATE, *v. a. (accelerare, Lat.)*  
To make quick, to hasten, to quicken motion (*Bacon*)

ACCELERATION *v. (acceleratio, Lat.)*  
1 The act of quickening motion. 2 The state of the body accelerated (*Alahur*)

ACCELERATION in mechanics, the increase of velocity in a moving body. Accelerated motion is that which continually receives fresh accessions of velocity, and either equally or unequally accelerated. Acceleration stands directly opposed to retardation, which denotes a diminution of velocity.

ACCELERATION is chiefly used in physics, in respect of falling bodies, &c. of heavy bodies tending towards the centre of the earth by the force of gravity. That natural bodies are accelerated in their descent, is evident from various considerations, both *a priori*, and *posteriori*.—Thus we actually find that the greater height a body falls from, the greater impression it makes, and the more vehemently does it strike the subject plane, or other obstacle. Various are the systems and opinions which philosophers have produced to account for this acceleration. But as most of them are merely visionary, or hypothetical we think it needless to describe them. I peculiarly, since if the reader will only admit the existence of such a force as gravity, so evidently inherent in all bodies, without regard to what may be the cause of it, the whole mystery of acceleration will be cleared up. Consider gravity then, with Galileo, only as a cause or force which acts continually on heavy bodies, and it will be easy to conceive that the principle of gravitation, which determines bodies to descend, must by a necessary consequence accelerate them in falling. A body having once begun to descend, through the impulse of gravity the state of descending is now, by Newton's first law of nature, become as it were natural to it, inasmuch that were it left to itself, it would for ever continue to descend even though the first cause of its descent should cease. But besides this determination to descend, impressed upon it by the first cause of motion, which would be sufficient to continue to infinity the degree of motion already begun, new impulses are continually superadded by the same cause, which continues to act upon the body already in motion, in the same manner as if it had remained at rest. There being then two causes of motion, acting both in the same direction it necessarily follows, that the motion which they unitedly produce must be more considerable than what either could produce separately. And as long as the velocity is thus continued, the same cause still subsisting to increase it more, the descent must of necessity be

continually accelerated. Suppose then that gravity from whatever principle it arises, acts uniformly upon all bodies at the same distance from the centre of the earth, dividing the time which the heavy body takes up in falling to the earth, into indefinitely small equal parts, gravity will impel the body toward the centre of the earth, in the first indefinitely short instant of the descent. If after this we suppose the action of gravity to cease the body will continue perpetually to advance uniformly toward the earth's centre, with an indefinitely small velocity, equal to that which resulted from the first impulse. But, if we suppose that the action of gravity still continues the same after the first impulse, in the second instant, or small part of time, the body will receive a new impulse toward the earth equal to that which it received in the first instant, and consequently its velocity will be doubled, in the third instant it will be tripled, in the fourth quadrupled, in the fifth quintupled, and so on continually for the impulse made in any preceding instant, is no ways altered by that which is made in the following one, but they are, on the contrary, always accumulated on each other. So that the instants of time being supposed indefinitely small, and all equal, the velocity acquired by the falling body, will be at every moment proportional to the time from the beginning of the descent, and consequently the velocity will be proportional to the time in which it is produced. So that if a body by this constant force acquire a velocity of 32 feet suppose in one second of time it will acquire a velocity 64 feet in two seconds, 96 feet in three seconds, 128 in four seconds, and so on. Not only but it seems strange that all bodies small or large, require by the force of gravity the same velocity in the same time. For every equal particle of matter being endued with an equal impelling force, namely its gravity or weight, the sum of all the forces, in any compound mass of matter, will be proportional to the sum of all the weights, or quantities of matter to be moved, consequently the force and masses moved being thus constantly increased, in the same proportion the velocities generated will be the same in all bodies, great or small. That is a double force moves a double mass of matter, with the same velocity that the single force moves the single mass, and so on. Or otherwise, the whole compound mass falls all together with the same velocity, and in the same manner, as if its particles were not united, but as if each fell by itself, separated all from one another. And thus all being let go at once, they would fall together, just as if they were united into one mass. The foregoing law of the descent of falling bodies, namely that the velocities are always proportional to the times of descent, as well as the laws concerning the spaces passed over, &c. were first discovered and taught by

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the great Galileo in his *Mechanical Dialogues*, the general inferences established relative to uniformly accelerated motions being as below 1<sup>st</sup> That the velocities acquired, are constantly proportional to the times, in a double time a double velocity, &c 2<sup>d</sup> That the spaces described in the whole times, each counted from the commencement of the motion, are proportional to the squares of the times, or to the squares of the velocities, that is, in twice the time, the body will describe four times the space, in thrice the time, it will describe nine times the space, in quadruple the time, sixteen times the space, and so on In short, if the times are proportional to the numbers - - 1, 2, 3, 4, 5, &c, the spaces will be as 1, 4, 9, 16, 25, &c, which are the squares of the former So that if a body by the natural force of gravity, fall through the space of  $16\frac{1}{2}$  feet in the first second of time, then in the first two seconds of time it will fall through four times as much, or  $64\frac{1}{2}$  feet, in the first three seconds it will fall nine times as much or  $144\frac{1}{2}$  feet, and so on And as the spaces fall in through are as the squares of the times, or of the velocities, therefore the times, or the velocities are proportional to the square roots of the spaces And the spaces described by falling bodies in a series of equal instants or intervals of times, will be as the odd

numbers - - - 1, 3, 5, 7, 9, &c  
which are the differences of the squares } 1, 4, 9, 16, 25, &c  
or whole spaces - - -

that is the body which has run through  $16\frac{1}{2}$  feet in the first second, will in the next second run through  $49\frac{1}{2}$  feet, in the third second  $80\frac{1}{2}$  feet, and so on 4<sup>th</sup> If the body fall through any space in any time it requires a velocity equal to double that space, that is, in an equal time with the last velocity acquired if uniformly continued, it would pass over just double the space So if a body fall through  $16\frac{1}{2}$  feet in the first second of time then it has acquired a velocity of  $32\frac{1}{2}$  feet in a second, that is if the body move uniformly for one second with the velocity acquired it will pass over  $32\frac{1}{2}$  feet in this one second and if in any time the body fall through 100 feet, then in another equal time, if it move uniformly with the velocity last acquired, it will pass over 200 feet, and so on (*Hutton's Dict* See also *Gregory's Mechanics*, vol 1 and *Hawley's Natural Philosophy*, vol 1) — The following theorems for practice, are derived from the general doctrine of acceleration Let  $g$  represent the velocity acquired by a body at the end of a second or unit of time by means of the accelerating force  $t$  the time or the number of seconds in which the body passes over any space  $s$ , and  $v$  the velocity acquired at the end of that time then we have  $v = g t$ , and  $s = \frac{1}{2} g t^2$ , from which two equations result the following

$$\begin{aligned} t &= \frac{v}{g} & \frac{2s}{v} &= \sqrt{\frac{2s}{g}} \\ &= g t & \sqrt{2g s} &= \frac{v}{g} \\ &= \frac{1}{2} g t^2 &= \frac{v^2}{2g} &= \frac{t^2 v}{2} \end{aligned}$$

And here, when the constant force is the natural force of gravity, then the distance  $\frac{1}{2} g$  descended in the first second, in the latitude of London, is  $16\frac{1}{2}$  feet but if it be any other constant force, the value of  $g$  will be different, in proportion as the force is more or less (See *LOCKE*) The motion of an ascending body or of one that is impelled upwards, is diminished or retarded by the same principle of gravity, acting in a contrary direction Such a body ascends until it has lost all its motion, which it does in the same piece of time, that the body would have taken up in acquiring, by falling a velocity equal to that with which the falling body began to be projected upwards And consequently the heights to which bodies ascend when projected upwards with different velocities, are to each other as the squares of those velocities

**ACCELERATION OF BODIES ON INCLINED PLANES** The same general laws obtain here, as in bodies falling freely or perpendicularly, namely that the velocities are as the times, and the spaces descended down the planes, as the squares of the times, or of the velocities But those velocities are less, according to the sine of the plane's inclination, and the spaces less according to the square of the sine See *INCLINED PLANE*

**ACCELERATING FORCE**, in physics, is the force that accelerates the motion or velocity of bodies, and it is equal to or expressed by, the quotient arising from the motive or absolute force, divided by the mass or weight of the body that is moved In physical considerations respecting forces, velocities, times, and spaces gone over, the first inquiry is the accelerating or accelerative force This force is greater or less in proportion to the velocity it generates in the same time, and by this velocity it is measured All accelerating forces are equal, and generate equal velocities, that have the motive forces directly proportional to the quantities of matter so a double motive force will move a double quantity of matter with the same velocity, as also a triple motive force a triple quantity, a quadruple force a quadruple quantity, &c all with the same velocity And this is the reason why all bodies fall equally swift by the force of gravity, for the motive force is exactly proportional to their weight or mass In general the accelerating force is in the direct ratio of the motive force, and inverse ratio of the quantity of matter — In the cases

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of variably accelerated motions, the formulæ laid down in a preceding article will require some modification here we are to consider the relations of the fluxions of the time, velocity, &c. Consequently taking the fluents of those expressions, in particular cases, the relations of time, space, velocity, &c. are obtained.

Now if  $t$  denote the time in motion,

$v$  the velocity generated by any force,

$s$  the space passed over,

and  $g$  the variable force at any part of the motion, or the velocity the force would generate in one second of time, if it should continue invariable, like the force of gravity, during that one second, and therefore the value of this velocity  $g$ , will be in proportion to  $32\frac{1}{2}$  feet, as that variable force, is to 1 the force of gravity. Then because the force may be supposed constant during the indefinitely small time  $t$ , and that in uniform motions the spaces and velocities are proportional to the times, we from thence obtain these two general fundamental proportions,

$$s \propto t^2 \quad \text{or } s = \frac{1}{2} g t^2,$$

$$v \propto t \quad \text{or } v = g t$$

From which are derived the four formulæ below, in which the value of each quantity is expressed in terms of the rest

$$1 \quad - - \quad t = \sqrt{\frac{2s}{g}}$$

$$2 \quad - - \quad v = g t$$

$$3 \quad - - \quad s = \frac{v^2}{2g}$$

$$4 \quad - - \quad g = \frac{v^2}{2s}$$

And these theorems equally hold good for the destruction of motion and velocity, by means of retarding forces, as for the generation of the same by means of accelerating forces.

ACCELERATION, in astronomy, is often used for the time whereby a fixed star in one diurnal revolution of the earth, appears to anticipate the mean motion of the sun. This apparent acceleration of the stars, arises from the retardation of the sun, owing to his apparent motion in his orbit towards the east, which is about  $59' 8'' \frac{1}{2}$  of a degree every day, and this is passed over in about  $3' 5'' \frac{1}{2}$  of mean time, that is, a fixed star rises, or sets, or passes the meridian, about  $3' 56''$  sooner each day than it did on the preceding one. This acceleration is, in fact, equal to the difference between the measures of a mean solar day, and a sidereal day.

ACCELERATION OF A PLANET. A planet is said to be accelerated in its motion, when its real diurnal motion exceeds its mean

diurnal motion. And, on the other hand, the planet is said to be retarded in its motion, when the mean exceeds the real diurnal motion. This inequality arises from the change in the distance of the planet from the sun, which is continually varying, the planet moving always quicker in its orbit when nearer the sun, and slower when farther off.

ACCELERATION OF THE MOON, a term used to express the increase of the moon's mean motion from the sun, compared with the diurnal motion of the earth, so that it is now a little swifter than it was formerly. Dr. Halley was the first who made this discovery, and he was led to it by comparing the ancient eclipses observed at Babylon with those observed by Albatennus in the ninth century, and some of his own time.—The moon's mean motion is deduced from a comparison of distant observations. The time between them, being divided by the number of intervening revolutions, gives the average time of one revolution, or the mean lunar period. When the ancient Chaldean observations are compared with those of Hipparchus, we obtain a certain period, when those of Hipparchus are compared with some in the ninth century, we obtain a period somewhat shorter, when the last are compared with those of Tycho Brahe, we obtain one still shorter, and when Brahe's are compared with those of our day, we obtain the shortest period of all—and thus the moon's mean motion appears to accelerate continually, and the accelerations appear to be in the duplicate ratio of the times. The acceleration for the century which ended in 1700 is about nine seconds of a degree, that is to say, the whole motion of the moon during the 17th century must be increased nine seconds, in order to obtain its motion during the 18th, and as much must be taken from it, or added to the computed longitude, to obtain its motion during the 16th, and the double of this must be taken from the motion during the 16th, to obtain its motion during the 15th, &c. Many conjectures have been offered as to the cause of this acceleration, and it was often looked upon as a stumbling block in the way of the Newtonian philosophy, until at length M. Laplace has happily succeeded in deducing it from the Newtonian law of planetary deflection. As this is a subject of considerable importance, we shall enter a little into M. Laplace's explanation.—The lunar period which we observe, is not that which would have obtained, had the moon been influenced by the earth alone. We should not have known that her natural period was increased, had the disturbing influence of the sun remained unchanged, but this varies in the inverse triplicate ratio of the earth's distance from the sun, and is therefore greater in our winter, when the earth is nearer to the sun. This is the source of the annual equation, by which the



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lunar period in January is made to exceed that in July nearly 24 minutes. The angular velocity of the moon is diminished in general  $\frac{1}{179}$ , and this numerical coefficient varies in the inverse ratio of the cube of the earth's distance from the sun. If we expand this inverse cube of the earth's distance into a series arranged according to the sines and cosines of the earth's mean motion, making the earth's mean distance unity, we shall find that the series contains a term equal to  $\frac{1}{2}$  of the square of the eccentricity of the earth's orbit. Therefore the expression of the diminution of the moon's angular velocity contains a term equal to  $\frac{1}{179}$  of this velocity, multiplied by  $\frac{1}{2}$  of the square of the earth's eccentricity, or equal to the product of the square of the eccentricity, multiplied by the moon's angular velocity, and divided by 179.33 ( $\frac{2}{3}$  of 179). Did this eccentricity remain constant, this product would also be constant, and would still be confounded with the general diminution, making a constant part of it; but the eccentricity of the earth's orbit is known to diminish, and its diminution is the result of the universality of the Newtonian law of the planetary deflections. Although this diminution is exceedingly small, its effect on the lunar motion becomes sensible by accumulation in the course of ages. The eccentricity diminishing, the diminution of the moon's angular motion must also diminish; that is, the angular motion must increase. —During the eighteenth century, the square of the earth's eccentricity has diminished 0.0000015325, the mean distance from the sun being = 1. This has increased the angular motion of the moon in that time, 0.0000001283. As this augmentation is gradual we must multiply the angular motion during the century by the half of this quantity, in order to obtain its accumulated effect. This will be found to be 9 very nearly, which exceeds that deduced from a most careful comparison of the motion of the last two centuries, only by a fraction of a second! While the diminution of the square of the eccentricity of the earth's orbit can be supposed proportional to the time, this effect will be as the squares of the times. When this theory is compared with observations, the coincidence is wonderful indeed. The effect on the moon's motion is periodical, as the change of the solar eccentricity is, and its period includes millions of years. Its effect on the moon's longitude will amount to several degrees before the secular acceleration change to a retardation (*Encyclo Britan*).

**ACCELERATOR URINÆ** (*accelerator*, sc. *musculus*, from *accelero*, to hasten) *Tycculator seminis*. *Bulbo-cavernosus* of Winslow. A muscle of the penis. It arises fleshy from the sphincter ani and membranous part of the urethra, and tendinous from the crus, nearly as far forwards as the beginning of the corpus cavernosum penis, the inferior fibres run more

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transversely, and the superior descend in an oblique direction. It is inserted into a line in the middle of the bulbous part of the urethra, where each joins with its fellow, by which the bulb is completely closed. The use of this pair of muscles is to drive the urine or semen forward, and by grasping the bulbous part of the urethra, to push the blood towards its corpus cavernosum, and the glands by which they are distended.

**To ACCEND, v a** (*accendo*, Lat.) To kindle, to set on fire (*Decay of Piety*).

**ACCENDENES**, a lower order of ministers in the Romish church, whose office is to light and trim the candles.

**ACCENDONES**, or **ACCEDONES**, in Roman antiquity, a kind of officers in the gladiatorial schools, who excited and animated the combatants during the fight.

**ACCENSI**, in Roman antiquity, was applied to three descriptions of persons. 1. To certain supernumerary soldiers, designed to supply the places of those who should be disabled or killed. 2. To a kind of adjutants appointed by the tribune to assist each centurian and decurion. 3. To an inferior order of officers, appointed to attend the Roman magistrates, somewhat in the manner of ushers or tipstaves among us.

**ACCENSION, s** The act of kindling, or setting a body on fire. Thus the accension of tinder is effected by striking fire with flint and steel.

**ACCENT, s** (*accentus*, Lat.) 1. The manner of speaking or pronouncing. 2. The sound of a syllable (*Shaks*). 3. The marks made upon syllables to regulate their pronunciation (*Holder*). 4. A modification of the voice, expressive of the passions or sentiments (*Pryn*).

**ACCENT** in its primitive sense an affection of the voice which gives each syllable of a word its due pitch in respect of height or lowness. The word is originally Latin, *accentus* a compound of *ad*, to, and *canto*, to sing. In this sense, accent is synonymous with the Greek *tonos*, the Latin *tenor*, or *tonor*, and the Hebrew *נוקשטוס*, taste. The accent, properly, only respects high and low or acute and grave. Though the modern grammarians use it also in respect of loud and soft, long and short, but this confounds Accent with Quantity.

**ACCENT** is also used in grammar, for a character placed over a syllable to mark the accent, i. e. to shew it is to be pronounced in a higher, or in a lower tone, and to regulate the inflections of the voice in reading. It is distinguished from emphasis, as the former regard the tone of the voice, the latter the strength of it. We reckon three grammatical accents in ordinary use, all borrowed from the Greeks, viz the *acute accent*, which shews when the tone of the voice is to be raised. In modern writings it is a little line, or *virgula*,



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placed over the vowel, a little sloping or inclined, in its descent, from right to left, as *á*. It is not ordinarily used, either in English or Latin: the French, indeed, retain it, but it is only to mark the close or masculine *é*—The *grave accent*, when the note or tone of the voice is to be depressed, and is figured thus *à*—The *circumflex accent*, which is composed of both the acute and the grave, it points out a kind of undulation of the voice, and is expressed thus *â*. But if it be true that the whole system of pronunciation turns on three accents, it is no less true, that each of these three admits of several degrees. The acute accent, for instance, may be either higher or lower, may be simply acute, or very acute, and the like holds of the grave and circumflex. So that each of the three common accents is, as it were, a genus, including divers particular species, though the ancient grammarians have not thought fit to give particular names and figures to all these differences. The Hebrews have a grammatical, rhetorical, and a musical accent, though the first and last seem, in effect, to be the same, both being comprised under the general name of *triple accents*, because they give the proper tone to syllables: the rhetorical accents are said to be euphonic, inasmuch as they tend to make the pronunciation more sweet and agreeable. There are four euphonic accents and twenty-five tones, however authors are not agreed as to the number, of which some are placed above, and others below the syllable, the Hebrew accents serving not only to regulate the risings and fallings of the voice, but also to distinguish the sentence, period, and number of periods, in a discourse, and to answer the same purpose with the point in other languages. Their accents are divided into emperors, kings, dukes, &c. each bearing a title answerable to the importance of the distinction it makes. Their emperor rules over a whole phrase and terminates the sense completely answering to our point. Their king answers to our colon, and their duke to our comma. The king, however, occasionally becomes a duke, and the duke a king, as the phrases are more or less short. The Hebrew accents in effect, have something common with those of the Greeks and Romans, and something peculiar to themselves. What they have in common, is that they mark the tone, showing how the voice is to be raised, and sunk, on certain syllables. What they have peculiar is that they do the office of the points in other languages. It is certain that the ancient Hebrews were not acquainted with these accents, their origin and use therefore have been much controverted. And there has been full as much dispute concerning the antiquity, &c. of the Greek accents as of those of the Hebrew. The use of accents to prevent ambiguity is most remarkably perceived in some eastern language, particularly the Sanscrit and

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Chinese. Among the people of China, every word, or (which is the same thing) syllable, admits of five accents, as spoken more acutely or remissly, and thus stands for many different things. The same sound *ya*, according to the accent affixed to it, signifies God, a will, excellent, stupidity, and a goose. The Chinese have but 330 spoken words in their language, but these being multiplied by the different accents or tones which affect the vowels, furnish a language tolerably copious. By means hereof, their 330 simple sounds come to denote 1600 things, but this being hardly sufficient, they are increased further by aspirates added to each word to double the number. The Chinese only reckon four accents, for which the missionaries use the following marks, *â, á, à, a*, to which they have added a fifth, thus *ã*. Among the English it is found that emphasis in particular cases, alters the sort of the accent. This is demonstrable from the following example. "He shall *increase*, but I shall *decrease*." There is a difference between giving and *forbearing*. "In this species of composition *possibility* is much more essential than *probability*." In these examples, the emphasis is required the accent to be placed on syllables to which it does not commonly belong.

**ACCENT** in music is a modulation of the voice to express a passion. Every bar or measure is divided into accented and unaccented parts. The accented parts are the principal, being thought to elicitly to move and affect: it is on these the spirit of the music depends. Hence the harmony is in general to be full and varied of discords in the accented parts of the measure while in the unaccented part discords are allowed. In common time, of four crotchets in a bar, the accentuation will fall usually on the first and third crotchets of the bar: in triple time on the first note of the bar. But this rule is often departed from, and with much success.

**TO ACCENT** *v. a* (from *accentus* Lat) 1 To put the accent on words with particular grammatical rules or rules (*to check*) 2 To try, to pronounce or utter in general (*to declaim*) 3 To write or note the accent.

**TO ACCENTUATE** *v. a* (*accentuare*, Fr) To place the proper accents over the vowels.

**ACCENTUATION**, *s* (from *accentuare*) The act of placing the accent in pronunciation.

**TO ACCUSE** *v. a* (*accipio* Lat *acceptor*, Fr) 1 To take with pleasure, to accept kindly, to admit with approbation (*Dryden*) 2 In the language of the Bible, to accept person, is to act with personal and partial regard.

**ACCEPTABILITY**, *s* The quality of being acceptable (*Faglar*).

**ACCEPTABLE**, *a* (*acceptable*, French) Grateful, pleasing.

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**ACCEPTABLENESS**, *s* (from *acceptable*) The quality of being acceptable (*Cru*)

**ACCEPTABLY**, *ad* (from *acceptable*) In an acceptable manner (*Taylor*)

**ACCEPTANCE**, *s* (*acceptance*, *Fr*) Reception with approbation (*Spenser*)

**ACCEPTANCE**, in common law, denotes a tacit agreement to a preceding act, which might have been defeated and avoided, were it not for such acceptance had.—If a man and his wife, seized of land in the right of the wife, make a joint lease, or scolden by deed reserving rent, the man dying, and the wife receiving the rent, such receipt is deemed an acceptance, and shall make the lease void so that she shall be barred from bringing the writ, *Cum vita*

**ACCEPTANCE**, in commerce is the subscribing, signing, and mailing one's self debtor for the sum contained in a bill of exchange, or other obligation. If the creditor is a right understanding between both parties, a small matter amounts to an acceptance, as 'I give your bill with me, and I will accept it' or, 'I'll for it to-morrow' and it shall be accepted. This obligation is effectually by the custom of the merchants and of law, and if the party had actually signed the bill. But should a man say 'I give your bill with me and I will look over my account between the drawer and me, and call to-morrow, and I will accept the bill accordingly,' this shall not amount to a complete acceptance for this mention of the account, was really intended to give him an opportunity of examining if there were defects in his hands to answer, without which perhaps he would not accept the same so it was ruled by Lord Chief Justice Hall.

**ACCEPTATION**, *s* (from *accept*) 1 Reception whether good or bad (*Sidney*) 2 Good reception, acceptance (*Ra'elz'h*) 3 The state of being acceptable, received 4 Acceptance in the juridical sense (*Saath*) 5 The meaning of a word, as it is commonly received (*Bentley*)

**ACCEPTOR** or **ACCEPTOR**, *s* (from *accept*) The person that accepts

**ACCEPTATION**, *s* (*acceptatio* *Lat*) The remission of a debt by an acquittance from the creditor testifying the receipt of money which has never been paid

**ACCEPTION**, *s* (*acception*, *Fr* from *acceptione* *Lat*) The received sense of a word, the meaning not in use (*Hanmond*)

**ACCESS**, *s* (*accessus*, *Lat* *access*, *Fr*) 1 The way by which any thing may be approached (*Hammond*) 2 The means, or liberty of approaching either to things or men (*Milton*) 3 Increase, enlargement, addition (*Bacon*) 4 The return or fits of a distemper

**ACCESSARINESS**, *s* (from *accessary*) The state of being accessory

**ACCESSARY**, *a* (a corruption of *access*

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*sony*) That contributes to a crime without being the chief constituent of it (*Clarend*)

**ACCESSIBLE**, *a* (*accessibilis*, *Lat* *accessile*, *Fr*) That may be approached (*Addison*)

**ACCESSION**, *s* (*accessio*, *Lat* *accession*, *Fr*) 1 Increase by something added, enlargement, augmentation (*Rogers*) 2 The act of coming to, or joining one's self to as accession to a confederacy 3 The act of arriving at, is the King's accession to the throne

**ACCESSION**, (*accessio*, *f* from *accedo*, to approach) The approach or commencement of a disease. A term mostly applied to a fever which has paroxysms or exacerbations, thus the accession of fever denotes the commencement or approach of the paroxysmal period

**ACCESSORY** or **WILLIS** (*accessorius*, *sen* *Lat* from *accedo*, to approach, so called from the course they take) The number given by Willis to two nerves which ascend, one on each side from the second fourth and fifth cervical pairs of nerves through the foramen of the occipital bone and pass out again from the cranium through the foramen transversum with the pterygum to be distributed on the trapezius muscle

**ACCESSORY**, *ad* (from *accessory*) In the manner of an accessory

**ACCESSORY**, *a* joined to another thing so as to increase it, additional (*Hucker*)

**ACCESSORY**, *s* (*accessorius* *Lat* *accessorie*, *Fr*) Some person or thing which accedes or is added to another more considerable person or thing

**ACCESSORY** or **ACCESSAR** in common law, is chiefly used for a person guilty of a felony offence not principally but by participation is by advice, command or concealment. There are two kinds of accessories before the fact, and after it. The first is he who commands or procures another to commit felony, and is not present himself, for if he be present he is a principal. The second is he who receives assists or comforts any man that has done murder, or felony, which of he has knowledge. A man may also be accessory to an accessory by aiding receiving, &c in accessory in felony. An accessory in felony shall have judgment of life and member, as well as the principal, who did the felony, but not till the principal be first attainted, and convicted, or outlawed thereon. Where the principal is pardoned without attinder, the accessory cannot be arraigned it being a maxim in law. But non est principis, non potest esse accessarius. But if the principal be pardoned, or have his clergy after attinder, the accessory shall be arraigned 4 and 5 W and M c 4. And by stat 1 Anne, c 9 it is enacted that where the principal is convicted of felony or finds mute or challenges above twenty of the jury, it shall be lawful to proceed against the accessory in the same manner as if the principal had been attainted,

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and notwithstanding such principal shall be admitted to his clergy, pardoned, or delivered before attainder. In some cases also, if the principal cannot be taken, then the accessory may be prosecuted for a misdemeanor, and punished by fine, imprisonment, &c. Stat. ibid. See stat. 5 Anne, c. 31. In the lowest and highest offences there are no accessories, but all are principals as in riots, routs, forcible entries, and other trespasses, which are the lowest offences. So also in the highest offence, which is, according to our law, high treason, there are no accessories. Cok. Littleton 71.

**ACCIDENCE**, *s* (a corruption of *accidents*, from *accidentia*, Lat.) The little book containing the first rudiments of grammar, and explaining the properties of the eight parts of speech.

**ACCIDENT**, *s*, **ACCIDENT**, in philosophy. Per accidens, is frequently used among philosophers to denote what does not follow from the nature of a thing, but from some accidental quality thereof in which sense it stands opposed to *per se*, which denotes the nature and essence of a thing. Thus, fire is said to burn *per se*, or considered as fire, and not per accidens, but a piece of iron, though red-hot, only burns per accidens, by a quality accidental to it, and not considered as iron.

**ACCIDENS**, (from *accido*, to happen) A symptom in diseases.

**ACCIDENT**, *s* (*accidens*, Lat.) 1 The property or quality of any being, which may be separated from it, at least in thought (*Davies*). 2 In grammar, the property of a word (*Halden*). 3 That which happens unforeseen, casually, chance (*Hooler*).

**ACCIDENT**, in heraldry, an additional point or mark in a coat of arms which may be either omitted or retained without altering the essence of the armour, such as abatement, difference, and tincture.

**ACCIDENTAL**, *s* (*accidental*, Fr.) A property nonessential (*Halls*).

**ACCIDENTAL** *a* (from *accident*) 1 Having the quality of an accident non-essential (*Tillotson*). 2 Casual, fortuitous, happening by chance.

**ACCIDENTAL COLOURS** are those which depend upon the affections of the eye, in contradistinction to those which belong to the light itself. The impressions made upon the eye by looking steadfastly at a particular colour are various, according to the single colour or combination of colours in the object and they continue for some time after the eye is withdrawn, and give a false colouring to other objects. Mr. Buffon has endeavoured to trace the connections which these accidental colours have with such as are natural, in a variety of instances. The same subject has likewise been ingeniously treated by Dr. Darwin.

**ACCIDENTAL DIGNITIES**, and **DEBILI-**

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**TIES**, in astrology, certain casual dispositions of the planets, whereby they are supposed to be either strengthened, or weakened.

**ACCIDENTAL POINT**, in perspective, is that point in the horizontal line where the projections of two lines parallel to each other meet the perspective plane.

**ACCIDENTALLY**, *ad* (from *accidental*) 1 After an accidental manner (*Harvey*). 2 Casually, fortuitously (*Swift*).

**ACCIDENTALNESS**, *s* (from *accidental*) The quality of being accidental.

**ACCIPIENT**, *s* (*accipiens*, Lat.) A receiver.

**ACCIPIITER**, (from *accipio*, to take or seize) 1 The hawk, so named from its rapacity. Its fat was formerly esteemed in medicine as an antidote in ophthalmias (See *FALCO*). 2 Accipiter means also a bandage for the nose, from the tightness of its grasp, or its hawk's-claw shape.

**ACCIPIFRANA** See **HIERACIUM**, and **SISYMBRIUM**.

**ACCIPITRES** The first order of the Linnæan class, Birds, the ordinal character being, bill somewhat hooked downwards, the upper mandible dilated near the point, or armed with a tooth, nostrils open, legs short, and strong, feet formed for perching, having three toes forwards and one backwards, toes warty under the joints, claws hooked and sharp pointed, body muscular, flesh tough and not fit to be eaten, food, the carcases of other animals, which they seize and tear, nest in high places, eggs about four, female larger than the male, they live in pairs. See **ZOOLOGY**.

**ACCISMUS**, denotes a feigned refusal of something which a person earnestly desires. The word is Latin, or rather Greek *ακισμος*, supposed to be formed from *Acco*, the name of a foolish old woman famous in antiquity for an affectation of this kind. In rhetoric, it is used as a species of irony.

**To ACCITE**, *v a* (*accito*, Lat.) To call; to summon.

**ACCIUS** (Lucius), a Latin tragic poet, was born according to some in the year of Rome 583. He wrote several tragedies, on subjects taken from the Grecian history, and one, entitled Brutus, from the Roman. Two comedies, one named the Wedding, and the other the Merchant, are also ascribed to him. His style has been accounted too harsh, but he is generally allowed to have been a great poet. Besides these performances, he wrote his Annals, and several poems. There was also, in the same age, an orator of the name of Accius, against whom Cicero defended Cluentius. He was a native of Pisaurum.

**ACCLAM**, *s* (*acclamo*, Lat.) A shout of praise, acclamation (*Milton*).

**ACCLAMATION**, a confused noise, or shout of joy, by which the public express

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their applause, esteem, or approbation of any thing. Acclamation, in a more proper sense, denotes a certain formula of words, uttered with extraordinary vehemence, and in a peculiar tone, somewhat resembling a song frequent in the ancient assemblies. Acclamations were usually accompanied with applauses, with which they are sometimes confounded, though they ought to be distinguished, as acclamation was given by the voice, applause by the hands, besides, acclamation was also bestowed on persons absent, applause only on those present. Acclamation was also given by women, whereas applause seems to have been confined to men. Acclamation, at first practised in the theatre, and passing thence to the senate, &c. was in process of time received into the acts of councils, and the ordinary assemblies of the church. The preacher, when admired, was interrupted by various expressions of approbation. *Orthodox!* *Third Apostle!* &c. These exclamations being carried to excess, and often misplaced, were at length abrogated, though they appear to have been used as low down as the time of St Bernard.

**ACCLAMATION**, in rhetoric, the same as **EPHONEMA**.

**ACCLIMATION MEDALS**, among antiquaries, such as represent people in the posture of acclamation.

**ACCLIVITY**, *s* (from *acclivus*, *Lat*) The steepness or slope of a line inclining to the horizon, reckoned upward, as the ascent of a hill is the acclivity, the descent is the declivity (*Ray*).

**ACCLIVOUS**, *a* (*acclivus*, *Lat*) Rising with a slope.

**To ACCLOY**, *v a* (See **CLOY**) 1 To fill up, in an ill sense, to crowd, to stuff full (*Spenser*). 2 To fill to satiety (*Ray*).

**ACCLOYID**, signifies picked, thus, a horse's foot when picked in shoeing, is said to be accloyed.

**To ACCOIL**, *v n* (See **COIL**) To crowd, to bustle, to be in a hurry (*Spenser*).

**ACCOLA** among the Romans, signified a person who lived near some place, in which sense, it differed from *incola*, the inhabitant of such a place.

**ACCOLADE**, a ceremony anciently used in the conferring of knighthood and supposed to be the embrace, or kiss which princes anciently gave the new knight, as a token of their affection. Others will rather have it to be a blow on the clunc of the neck, given on the same occasion.

**ACCOLADE**, sometimes synonymous with **ACCLADE**. It is also used in various senses in heraldry, sometimes it is applied to two things joined, at other times, to animals with crowns, or collars about their necks, as the lion in the Ogilvy's arms, and, lastly, to maces, swords, &c. placed salterwise behind the shield.

**ACCOLENT**, *s* (*accolens*, *Lat*) A borderer

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**ACCOMMODABLE**, *a* (*accommodabilis*, *Lat*) That may be fitted (*Hall's*).

**To ACCOMMODATE**, *v a* (*accommodo*, *Lat*) 1 To supply with conveniences (*Shakspeare*). 2 To adapt, to fit (*Locke*). 3 To reconcile, to adjust what seems inconsistent or at variance (*Norris*).

**ACCOMMODATE**, *a* (*accommodatus*, *Lat*) Suitable fit (*Tillotson*).

**ACCOMMODATELY**, *ad* Suitably, fitly.

**ACCOMMODATION**, *s* (from *accommodate*) 1 Provision of conveniences. 2 In the plural, conveniences, things requisite to ease or refreshment (*Landen*). 3 Adaptation, fitness (*Hale*). 4 Composition of a difference, reconciliation. To know a thing by accommodation, is to know it by the idea of a similar thing referred thereto. A prophecy of Scripture is said to be fulfilled various ways, properly, is when a thing foretold comes to pass, and improperly, or by way of accommodation, when in event happens to any place or people, like to what fell out some time before to another. The primitive church accommodated multitudes of Jewish, and even heathen ceremonies and practices, to Christian purposes, but the Jews had before done the same by the Gentiles, some will even have circumcision, the tabernacle, brazen serpent, &c. to have been originally of Egyptian use, and only accommodated by Moses to the purposes of Judaism. Some modern theological, or anti-theological writers, have carried this principle of accommodation to a very great extent indeed. They have stripped the Bible of almost every thing which characterises it as a system of revealed religion, and have thus accommodated it to the views of Deists in general.

**ACCOMPANABLE**, *a* (from *accompany*) Suitable, not used (*Sidney*).

**ACCOMPANIER**, *s* (from *accompany*) The person that makes part of the company, a companion.

**ACCOMPANIMENT**, in music, those instrumental parts in a composition which do not include the principal or principals, but which are added to relieve them, to supply the necessary chorus, fill up the harmony, decorate and heighten the general effect.

**ACCOMPANIMENT**, in heraldry, any thing added to a shield by way of ornament, as the belt, mantling, supporters, &c.

**ACCOMPANIST**, or **ACCOMPANIER**, in music, the performer who takes the accompanying part. Rousseau has very admirably enumerated the qualifications of an accompanier. "Whoever, say he, undertakes to accompany a song or solo, should be a consummate musician, well skilled in harmony, and the construction of the several parts, should have a nice and cultivated ear, a hand prepared for all difficulties of execution in the bass, and modulation into different keys, with a sound

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judgment and good taste. It is the business of the accompanist on the organ, harpsichord, or piano forte, to give the pitch to the several instruments, and the time of the whole band to have always under his hand the note which the singer is about to deliver, in order to correct, if false, and enforce, if feeble, and, at the beginning of music or movement, to run with energy and precision the several parts of the part that the orchestra, if a quick air, may proportion the rapidity to the abilities of the singer, and whether quick or slow indicate such a specific motion as suits the genius of the composition, and the design of the composer. But above all, whoever is accompanying another to whom the principal melody is assigned, should remember, that he is a servant, an humble attendant on a temporary superior, and should suppress all ambition of shining at the expense of the voice or instrument which he accompanies.

**To ACCOMPANY** *v a* (*accompagner* Fr) To be with another as a companion (*Swift*)

**To ACCOMPANY** *v n* To associate with, to become companion to (*Bacon*)

**ACCOMPICE** *v* (*complire*, Fr from *complet*, Lat) 1 An associate, a partner (*Swift*) 2 A partner or cooperator (*Addison*) The word is generally applicable to criminal, and is synonymous with *Accessary*. By the law of Scotland the accomplice can only be prosecuted after the conviction of the principal offender.

**To ACCOMPLISH** *v a* (*accomplir* Fr from *complet* Lat) 1 To complete, to execute fully (*Chalmers*) 2 To complete a period of time (*Daniel*) 3 To fulfil, is prophesy (*Addison*) 4 To run, to obtain (*Shakspeare*) 5 To a torn, or turn the current mind or buoy (*Shakspeare*)

**ACCOMPLISHMENT** *p n* 1 Complete in some qualification (*Isaiah*) 2 The act finished in respect of embellishments (*Milton*)

**ACCOMPLISHER** *v* (*accomplisseur*) The person that accomplishes

**ACCOMPLISHMENT** (*accomplissement*, Fr) 1 Completion, all performing perfection (*Hayward*) 2 Completion as of a prophecy (*Atterbury*) 3 Embellishment, elegance, ornament of mind or body (*Addison*) 4 The act of obtaining any thing (*South*)

**ACCOMPT** *v* (*compte* Fr) An account a reckoning (*Hooker*)

**ACCOMPLIANT**, *v* (*accomptant*, Fr) A reckoner, a computer (*South*)

**ACOPUM** *accopum* 1000 a pike and accompain) A topical medicine used by the ancients both externally as a ointment or charge, and internally as an electuary. It is compounded of a great number of hot, penetrating ingredients, many of which are not now to be procured, and all of which may be answered by more simple preparations.

**To ACCORD**, *v a* (derived by some,

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from *chorde*, the string of a musical instrument, by others from *corda* hearts) 1 To make agree, to a just one thing to another (*Pope*) 2 To bring to agreement (*Hale*)

**To ACCORD** *v n* To agree, to suit one with another (*Fullarton*)

**ACCORD** *v* (*accord*, Fr) 1 A compact, an agreement (*Dryden*) 2 Concurrence, union of mind (*Spenser*) 3 Harmony, symmetry (*Dryden*) 4 Own accord, voluntary motion (*Spenser*)

**ACCORD** in law, a verbal agreement between two or more, where any one is injured by a trespass or other offence committed, to make satisfaction to the injured party, who, after the accord is performed, will be barred in law from bringing any new action against the aggressor for the same trespass.

**ACCORD**, in music (See **CONCORD**) The term *accord* is also sometimes used to describe the state of an instrument whose sounds have the proper relative proportion to each other.

**ACCORDANCE** *v* (from *accord*) 1 Agreement with a person (*Lawson*) 2 Conformity to something (*Laumont*)

**ACCORDANT** *a* (*accordant* Fr) Willing, in good humour (*Shakspeare*)

**ACCORDING** *prep* (from *accord*) 1 In a manner suitable to, agreeably to, in proportion (*Hooker*) With regard to (*Holbrooke*)

**ACCORDINGLY** *ad* (from *according*) Agreeably suitably, conformably (*Shakspeare*)

**To ACCOST** *v a* (*accoster* Fr) To speak first to address to salute (*Milton*)

**ACOSTABLE** *a* (from *accos*) 1 Agreeable, familiar, not in use (*Holbrooke*)

**ACCOUSE** *v* or *accuse* (from *accusare* Lat) A man or woman charged with a misdemeanor.

**ACCOUSEMENT**, *Fr* The act of doing wrong.

**ACCOUNT** *v* (from the old French *accont*) 1 A computation of debts or expence (*Shakspeare*) 2 The state or act of a computation 3 A value or estimation (*Hooker*) 4 Profit advantage (*Addison*) 5 Distinction, dispute, trial (*Pope*) 6 Regard, consideration, due (*Isaiah*) 7 A narrative relation 8 The review or examination of an affair taken by authority (*Matt*) 9 The relation and reason of transaction given to a person in authority (*Shakspeare*) 10 Explanation, assignment of causes (*Isaiah*) 11 An opinion previously established (*Bacon*) 12 The reasons of any thing collected (*Addison*)

**ACCOUNT** is taken sometimes in a particular sense, for the computation of time, thus we say, the Julian Account, the Gregorian Account &c. in which sense it is equivalent to style.

**ACCOUNT**, or **ACCOUNTS** is also used, collectively for the several books or registers which merchants keep of their affairs and negotiations (See **BOOK-KEEPING**) There are divers kinds of accounts among merchants, as personal, real, imaginary, general, particular accounts &c.

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**To ACCOUNT, v a** (See ACCOUNT) 1 **To esteem, to think, to hold in opinion** (*Deut*) 2 **To reckon, to compute** (*Holder*) 3 **To assign to** (*Clarendon*) 4 **To hold in esteem** (*Chron*)

**To ACCOUNT, v n** 1 **To reckon** (*Holder*) 2 **To give an account, to sign the causes** (*Swift*) 3 **To make up the reckoning, to answer for practices** (*Dryden*)

**ACCOUNTABLE a** (from *account*) **Of whom an account may be required, who must answer for** (*Oldham*)

**ACCOUNTANT a** (from *account*) **Accountable to be possible for** (*Shal p*)

**ACCOUNTANT s** (See ACCOMPANT) **A computer, a man skilled or employed in account** (*Brown*)

**ACCOUNTANT-GENERAL v** **officer in the Court of Chancery who receives all monies lodged in the court and conveys the same to the Bank of England**

**ACCOUNT BOOK, s** **A book containing accounts** (*Swift*)

**To ACCOUPLE v t** (from *coupler*, It) **To join or hold together** (*Bacon*)

**To ACCOURE v a** **To enter an with one's ship or estate** (*Shal p*)

**ACCOURT v t** (from *accout*, Fr) **To equip** (*Dmit*)

**ACCOURTEMENT s** (from *accout*) **The equipage, baggage, or furniture** (*Shal p*)

**ACCOURTION s** (from *accout*, It) **The act of equipping, or the state of being equipped** (*Shal p*)

**ACCREDITION s** (from *accrédit*, It) **The act of accrediting, or the state of being accredited** (*Shal p*)

**ACCREDIT v t** (from *accrédit*, It) **To give credit to, to add to the credit of** (*Shal p*)

**To ACCROACH v a** (from *accrocher*, It) **To draw to one's with a hook**

**ACCROCH v t** (from *accrocher*, It) **To draw to one's with a hook**

**ACCROCH v t** (from *accrocher*, It) **To draw to one's with a hook**

**ACCUBATION s** (from *accubare*, It) **The act of lying down**

**ACCUBATION s** (from *accubare*, It) **The act of lying down**

# A C C

**ACCUBATION s** (from *accubare*, It) **The act of lying down**

**ACCUBATION s** (from *accubare*, It) **The act of lying down**

**ACCUMULATED a** (from *accumulo*, Lat) **Accumulated**

**ACCUMULATED a** (from *accumulo*, Lat) **Accumulated**

**ACCUMULATED a** (from *accumulo*, Lat) **Accumulated**

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**ACCUMULATED a** (from *accumulo*, Lat) **Accumulated**

## A C E

**tio** (*Voss Etym Lat*) The accusation properly commenced, according to Pædianus, when the rous, or party charged, being interrogated denied he was guilty of the crime, and subscribed his name to the delatio made by his opponent (*Cul. Lev Jus* p 17)—By Magna Charta no Englishman shall be imprisoned or condemned on any accusation, without trial by his peers, or the law None shall be vexed upon any accusation, but according to the law of the land, and no man may be molested by petition to the king, &c unless it be by indictment, or presentment of lawful men, or by process at common law (*Stat 25 Ed III st 5 c 4 28 Ed III c 3*)

**ACCUSATIVE**, in the Latin grammar, is the fourth case of nouns, and signifies the relation of the noun on which the action implied in the verb terminates, and hence in such languages as have cases, these nouns have a particular termination called accusative as *Augustus vicit Antonium*, Augustus vanquished Antony Here *Antonium* is the noun, on which the action implied in the verb *vicit* terminates, and therefore must have the accusative termination Ovid, speaking of the palace of the sun, says, *Materiem superabat opus*, The work surpassed the material Here *materiem* has the accusative termination, because it determines the action of the verb *superabat* In the English language there are no cases, except the genitive, the relation of the noun being shewn by the assistance of prepositions, as *of, to, from, &c* By these means we are not embarrassed with the trouble and difficulties attending other languages

**ACCUSATORY**, *a* (from *accuse*) That produces or contains an accusation (*Ayliffe*)

**To ACCUSE**, *v a* (*accuso, Lat*) 1 To charge with a crime (*Dryden*) 2 To blame or censure (*Romans*)

**ACCUSER**, *s* (from *accuse*) He that brings a charge against another (*Ayliffe*)

**To ACCUSTOM**, *v a* (*accustomo, Fr*) To habituate, to inure (*Milton*)

**ACCUSTOMABLE**, *a* (from *accustom*) Of long custom, habitual, customary (*Hale*)

**ACCUSTOMABLY**, *ad* According to custom (*Bacon*)

**ACCUSTOMANCE**, *s* (*accoutumance, Fr*) Custom, habit, use (*Boyle*)

**ACCUSTOMARILY**, *ad* In a customary manner

**ACCUSTOMARY**, *a* (from *accustom*) Usual, practised, according to custom

**ACCUSTOMED**, *a* (from *accustom*) According to custom, frequent, usual (*Shaks*)

**ACF**, *s* (*as, Lat*) 1 An unit, 2 single point on cards or dice (*South*) 2 A small quantity (*Gov of the Tongue*)

**ACE**, a place of Arcadia, near Megalopolis, where Orestes was cured from the persecution of the Furies, who had a temple here

**ACEPHAL**, or **ACEPHALITE**, frequently occurs in ecclesiastical history, as the deno-

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mination of divers sects particularly, 1 Of those who in the affair of the council of Ephesus, refused to follow either St Cyril, or John of Antioch 2 The followers of Peter Monogus, in the fifth century 3 The adherents of Severus of Antioch

**ACEPHALUS**, or **ACEPHALOUS**, *a* Something that wants a head The word is composed of the privative *a* and *κεφαλη*, *caput*, head The levellers in the reign of Henry I were called *acephali* This word, in our ancient law-books, is also used for those poor people who had no proper lord, as holding nothing in fee, either of king, bishop, baron, or other feudal lord

**ACEPHALUS**, is used in poetry, to denote a verse defective at the beginning

**ACI R** The maple A genus of the Linnean class and order Polygamia Monœcia, thus generically characterised, calyx five-cleft, corol five-petalled, stamens eight, pistil one, capsules two or three; superior, single-seeded, terminating in an ala or wing The male genus, with eight stamens, has neither germ, nor style The entire genus comprises twenty species, of which the males are for the most part forest trees and are common to Europe and America The most frequent species in our own country is the acer pseudo-platanus, great maple, sycamore tree, plane or mock-plane It is often used in turnery, as the most convenient wood for dishes, bowls, and trinchers, and before the introduction of earthen ware, was used still more generally The most beautiful species of the plant is the acer rubrum, or scarlet maple, which is often cultivated for its lovely scarlet flower The acer campestre is chiefly grown in this country for hop-poles The acer saccharinum, the most useful species where it grows indigenously, as in North America being the source of the maple-sugar, from which it derives its specific name This plant springs generally to the height of forty feet, and the saccharine juice is obtained by tapping the tree with an auger about the months of February, March, and April Two full sized trees will yield at this period, when the alburnum or sap is rising, about twenty-three gallons of juice in twenty-four hours, from which very nearly five pounds of sugar are commonly obtained, although the sap is sometimes so richly impregnated with saccharine matter as to yield a pound averduois of sugar from every three gallons of its juice Yet even this last proportion is far less abundant than that afforded by the sugar-cane

**ACERATOS**, (from *a neg* and *κεραυ*, to mix) Unmixed, uncorrupted

**ACERB**, *a* (*acerbus, Lat*) Acid, with an addition of roughness (*Quincy*) Sour, sharp, astringent, rough, properties common to many immature fruits

**ACERBITY**, *s* (*acerbitas, Lat*) 1 A rough sour taste 2 Applied to men, sharpness of temper (*Pope*)

## ACE

**ACERIDES**, (from  $\alpha$  neg and  $\kappa\epsilon\rho\iota\varsigma$ , wax) Plasters made without wax

**ACERRA**, in antiquity, an altar erected, among the Romans, near the bed of a person deceased, on which his friends daily offered incense till his burial

**ACERRA** also signified a little pot wherein the incense and perfumes were put, to be burnt on the altars before the dead

**ACFROSE LEAF** (*acerosum folium*) In botany, linear and permanent, as in pine, fir, juniper, yew (*Lin Philo Bot 42*) In form of a needle, usually inserted at the base into the branch by articulation, as in the cone-bearing trees

To **ACERVATE**, *v a* (*acervo*, Lat) To heap up

**ACERVATION**, *s* (from *acervate*) The act of heaping together

**ACESCENT**, *a* (*acescens*, Lat) That has a tendency to sourness or acidity (*Arbut*)

**ACESIS**, ( $\alpha\kappa\iota\sigma\iota\varsigma$ , from  $\alpha\kappa\iota\sigma\mu\alpha\iota$ , to heal) 1 The herb water-sage, so called from the healing properties ascribed to it. 2 A cure, or restoration to health

**ACISFORIS**, **ACESTRIDES**, ( $\alpha\kappa\iota\sigma\tau\epsilon\rho\iota\varsigma$  and  $\alpha\kappa\iota\sigma\tau\epsilon\rho\iota\delta\iota\varsigma$ , from  $\alpha\kappa\iota\sigma\mu\alpha\iota$ , to heal) A female doctor or midwife

**ACETABULUM**, in antiquity, a measure containing about an eighth of our pint It frequently contained acetum, or vinegar, whence its name

**ACETABULUM** (*acetabulum*, *n* from *acutum*, vinegar, so called because it resembles the acetabulum, or old snuff, in which vinegar was held for the use of the table) The cavity of the os innominatum which receives the head of the thigh-bone See **OS INNOMINATUM**

**ACETARIA**, (*acetaria*, *n* from *acutum*, vinegar because they are mostly made with vinegar) Sulphids

**ACETATID** impregnated or combined with acid, the term is more particularly applied to combinations with vinegar or the acetic acid These combinations form neutral or secondary salts, which are now called acetates of those substances which were before said to be acetated

**ACETATED VEGETABLE ALKALI** See **KALI ACETATUM**

**ACETATED VOLATILE ALKALI** See **AQUA AMMONIÆ ACETATÆ**

**ACLIATS**, in chemistry, certain neutral salts formed by the combination of the acetic acid, or radical vinegar, with different substances or bases These salts differ from acetates in this respect—the acid employed in the production of the former is fully saturated with oxygen, or the acidifying principle, that is, it is completely acid, while that which is used to form the latter, contains a less proportion of oxygen than is sufficient to saturate it The different acetats are expressed by the addition

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of the word denoting the substance to which the acid is united, as acetat of ammoniac or ammoniacal acetat, acetat of lime, acetat of zinc, &c It is a general character of acetats, that when decomposed by mineral acid, they evolve a very strong and pungent white vapour, but they are too imperfectly known to enable us to state, with clearness, their specific properties

**ACETIC ACID**, in chemistry, *Radical Vinegar*, *Concentrated Acid of Vinegar*, or *Spirit of Venus*, one of the vegetable acids, produced by distilling the acetous acid with metallic oxydes It is of a green colour, but becomes white by rectification It is extremely volatile and inflammable, corrodes and cauterizes the skin, and when heated in contact with air, takes fire Combined with earths, alkalis, and minerals, it forms salts called acetats It has a larger proportion of oxygen than acetous acid, or rather a less proportion of base, being supposed to be nothing else than that acid deprived of a portion of its carbon This acid dissolves several metals, which are not soluble in the acetous acid, and forms acetic ether by partly decomposing and uniting with alcohol Its specific gravity is about 1 0026, and is never when pure less than 1 050 Acetic acid is generally procured by distilling acetate of copper (*distillat verdigris*) in a glass retort, with a regulated heat, till the bottom of the vessel is nearly red-hot it may also be obtained by distilling acetate of lead, soda, pot-ash, or lime, with sulphuric acid, but the product is contaminated by the gas of the latter acid A method, however, has lately been discovered and made known by Y Peris, jun (*Nicholson's Journal*, N S No 1 p 40) which he asserts will save three-fourths of the expence attending the common process, and produce an acid as white and pungent as that of commerce He directs to distil one part of sulphuric acid with two of good white vinegar, and to bring the mixture suddenly to ebullition the sulphuric acid that remains may serve for two more operations, but then it will be necessary to rectify the acid produced, as it will be impregnated with sulphurous acid gas—manganese is suggested for the purpose of rectification Acetic acid is frequently adulterated during the process of its formation, but oftener by design If it be contaminated by sulphurous acid, it may be known by drawing a little of the vapour into the lungs, when an unpleasant sensation will be felt, which, if the acid be pure, will not arise Sulphuric acid may be detected by a few drops of muriated barytes, or acetate of lead, which will form with it insoluble compounds, and fall down Tartareous acid is discovered by saturating with vegetable alkali (potash), which separates it in the form of white powder, copper, with carbonat of ammonia, and lead, by sulphuret of ammonia



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**ACETIFICATION**, the action or operation by which vinegar is made. See **ACETOUS FERMENIATION**.

**ACETIS**, compound or neutral salts, formed by the union of the acetic acid, or distilled vinegar, with different bases. the following are the most remarkable of these substances, and those whose properties are best known.

*Acetite of alumine*, formerly known by the names of acetted clay and the luminous mordant or the calico-printer's, is formed by uniting the acetic acid with the luteal substance, which can only be done by digesting the acid on alumine recently precipitated.

*Acetite of ammonia*, called formerly ammoniacal aceticus salt, and generally known as the spirit of Mindererus, is prepared by adding carbonated ammonia to distilled vinegar till it is saturated, or by distilling equal parts of acetted lead (sugar of lead) and muriat of ammonia (sal ammoniac). It is salt is very volatile, yet it may by slow evaporation, be obtained in crystals which are pungent and speedily attract moisture: it is decomposed by fire, by alkalis, which disengage the ammonia, and by mineral acids, which separate the aceticus.

*Acetite of baryte*, was first formed by Morveau & Guyton. It is usually prepared by adding carbonate of baryte to distilled vinegar (aceticus acid), or, which is better, by boiling, for few minutes the sulphuret of baryte in a slight excess of aceticus acid: filtering the solution, and setting it aside to evaporate, crystals may thus be obtained. This acetite has a pleasant taste: somewhat acid, is soluble in water, and does not deliquesce in the air: it is decomposable by most of the mineral acids. Its only use at present is as a re-agent, in detecting sulphuric acid.

*Acetite of limuth* called by Geoffroi, sugar of bisumum has a sweetish taste: remains permanent in the air and is decomposable by heat. It is easily procured by mixing together solutions of nitrat of bisumuth, and acetite of potash.

*Acetite of colalt*

*Acetite of copper* known to the ancients under the titles of crystals of Venus and vermillion. It is of a deep green colour: has a disagreeable coppery taste, is soluble in water and in alcohol, effloresces in air, and is decomposed by heat. See **VERMILION**.

*Acetite of jargon or jargoma*, formed by pouring aceticus acid on newly precipitated jargoma, has an astringent taste, is very soluble in water and in alcohol, it does not crystallize but when evaporated to dryness, it forms a powder, which does not attract moisture from the air.

*Acetite of iron or martial aceticus salt*, is composed of aceticus acid and brown oxyd of iron. It has a styptic sweetish taste, attracts moisture from the atmosphere, is decomposed

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in distilled water, by fire, and gradually by air. It affords with nutgall a very black ink, alkaline prussiate precipitate from it a very bright Prussian blue. Black, yellow, and brown oxyd (or rust) of iron, form with vinegar solutions of a beautiful red colour.

*Acetite of lead, vinegar of saturn, sugar of Saturn, extract of Saturn, sugar of lead, &c* according to the way in which it is prepared, is composed of aceticus acid and white oxyd of lead. It has a sweet taste, somewhat astringent, becomes yellow when exposed to the air, is decomposed by heat, and when distilled, the residuum takes fire spontaneously on exposure to the air. Paper dipped into acetite of lead forms excellent matches.

*Acetite of lime, calcareous acetite, salt of chalk, or salt of coral*, is composed of 3.7 parts of lime and 64.3 parts of aceticus acid and water. It is readily procured by adding this acid to chalk, marble, corail, or any similar substances. It is sour, bitter, and rather caustic, easily soluble in water, effloresces in the air, is decomposed by fire, by fixed alkalis, and by mineral acids. It is used in medicine.

*Acetite of magnesia magnesian aceticus salt*, is prepared by saturating aceticus acid with carbonate of magnesia boiling the liquor, and filtering it if turbid. It is of a sweetish taste, is very soluble in water and alcohol, deliquesces in the air and is decomposable by heat, mineral acids, baryte, lime, and the alkalis.

*Acetite of mercury, mercurial foliated earth*, is prepared in an instant by pouring a nitric solution of mercury into a solution of acetite of potash, by which means the acid is united with the mercury and filtering the mixture. This salt has a disagreeable taste, and excites coughing, it becomes black by exposure to the air, and is decomposable by heat.

*Acetite of potash arcanum tartari, lab acetatum secret foliated earth of tartar, essential salt of urine, digestive salt of Sylvius*, occurs native in the sap and some other vegetable juices, and in the urine of some quadrupeds. It is composed of 61.5 parts of potash, and 32.5 of aceticus acid and water, and is artificially prepared either by adding distilled vinegar to pearlsh, or carbonate of potash till the liquor contain a slight excess of acid, and then evaporating to dryness, if required, or by adding sulphur of potash to acetite of lime, evaporating to dryness, and dissolving out the acetite of potash by hot alcohol. Acetite of potash has a sharp warm taste, and a lively penetrating odour, it is soluble in alcohol, and in about ten times its weight of water, its crystals, which are obtained by cooling its hot saturated solution in alcohol, are very white, and assume the form of thin plates, it is very deliquescent in air, and melts like wax when heated. It is much used in medicine.

*Acetite of silver*, formed by dropping acetite

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of soda or potash, into a saturated solution of nitrat of silver, has a sharp taste, and forms small oblong crystals, easily dissolved in water, it is decomposed by heat, and by muriat of magnesia

*Acetite of soda, terra foliata mineralis, mineral acetous salt*, is formed in crystals by adding distilled vinegar to carbonat of soda, evaporating to a pellicle, and cooling. It has a sharp bitterish taste, is permanent in the air, soluble in water, and is melted in a strong heat. It can only be obtained in crystals when there is an excess of alkali in the solution. It is used sometimes in France as a medicine.

*Acetite of uranium*, was first formed by Klaproth. Its crystals are regular four-sided slender prisms, they are transparent, and of a beautiful yellow colour, they are decomposed by heat, and what is singular, if they are heated gradually red hot, the oxyd which remains retains nearly the form of the crystals.

*Acetite of zinc, acetous salt of zinc*, is soluble in water, decomposed by heat, but not altered by exposure to the air, when thrown upon burning coals, it explodes with a blue flame, its crystals are rhomboid or hexagonal plates, of a white colour, and have the appearance of ice.

**ACETIOSA** (from *aceto, to be sour*) Rumex acetos. of Linneus. (L. s. hexandrin order trigynia, common sorrel or sour-dock. See RUMEX.)

**ACETIOSUM** *a* That has in it any thing sour, acetous.

**ACETIOSITIA** (dimin. from *acetosa*) Wood sorrel. See LALUISA.

**ACETOSITY** *s* (from *acetose*) The state of being acetous, or of containing sourness.

**ACETIOUS** *a* (from *acetum* vinegar) Having the quality of vinegar, sour (Boyle).

**ACETOUS ACID** *distilled vinegar* or the *acid of vinegar* is obtained from mucilaginous substances by that degree of fermentation which succeeds the spirituous, called the acetous fermentation, and by concentrating the product. It is a transparent colourless fluid, of the specific gravity of 1.0005, nearly as volatile as water, exhaling a pungent fragrant odour, and of a lively agreeable taste. This acid is sometimes confounded with vinegar which is improper, because though it necessarily exists in that fluid yet it is seldom found there undistilled, and is always diluted. It is indeed the purer part of vinegar, and is obtained from it by distillation on freezing or both. See VINEGAR.

Acetous acid is composed of oxygen and hydrogen, and carbon, but their relative proportions are not known, of the latter substance, however, this acid possesses a greater proportion than the acetic acid. To obtain the acetous acid by distillation from vinegar it is necessary to make use of glass, or tinned copper vessels, or else a stone crucible with a capital. The first product is a phlegm of a lively and agree-

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able smell, scarcely acid, to this succeeds the acetous acid, which becomes more acid though less odorous, as the process advances. When about three fourths of the liquor is come over, the process should be stopped, only about two thirds of the product is good acid, the first being too much diluted, and such as ought to be rejected. If distilled vinegar be exposed to frost, in a broad shallow vessel, and the ice removed as it forms, a still stronger and purer acid will be obtained, which, when crystallised, is called by Lowitz *glacial vinegar*. His process is described in *Chemical Journal* and in the *Supplement to L'ency Brit* vol. 1 p. 231.

Acetous acid unites eagerly with water, either liquid or condensed, imbibing heat in the former case, and giving it out in the latter, it has very little action upon fat oils, but readily dissolves essential oils and unites their odours, it decomposes atmospheric air, by abstracting its oxygen, at a temperature a little above that of boiling water, at the same time giving out flame, and producing carbonic acid and water, lastly it is capable of combining with a great variety of bodies and thus forming salts called acetates—with the alkaline earths and alkalis it forms alkaline acetites, and with the oxides of metals (for it will not unite easily with the metals themselves, except iron and zinc) it forms metallic acetates. See ACETATE, under which article the most important of these substances are described.

Acetous acid is often adulterated if made in a still with a pewter head, it always contains lead in solution which may be discovered by mixing with the acid an equal quantity of water impregnated with sulphurated hydrogenous gas, when the metal will appear in the form of a black precipitate the presence of sulphurous acid is detected by nitrat of baryte or acetite of lead.

Acetous acid is much used in medicine, and in the well known for vinegar is employed as an agreeable condiment in our food, and for the preservation of animal and vegetable substances. It is the *acetum distillatum* of the London College of Physicians.

The French chemists Adet and Durraeq are of opinion, that there exists no difference between the acetous and the acetic acids, except that the former contains a larger proportion of water, and an extractive or mucilaginous matter, if this opinion be established, there will not be two different kinds of salts produced by its combination, but as there will be only the acetic acid, it will form acetates but not acetites, as has been hitherto believed. See Philosophical Magazine vol. xiii p. 12, &c.

**ACLIUM** a term sometimes applied to vinegar, particularly in those preparations of which this substance forms the bases, as *acetum alkalinizatum, acetum exuvians, &c*.

**ACE'TUM AROMATICUM**, aromatic vinegar, an elegant preparation of the Edinburgh pharmacopoeia, formed and improved upon that

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long known by the name of thieves' vinegar Its virtues are antiseptic, and its odour highly refreshing in hospitals, courts of justice, and other crowded places

**ACE TUM DISTILLATUM** Distilled vinegar, acetic acid

**ACE TUM SCILLÆ**, or scilliticum, vinegar of squills, a preparation attenuant, expectorant, and diuretic

**ACHABYTUS**, in ancient geography, a high mountain in Rhodes, on the top of which stood a temple of Jupiter

**ACHÆANS**, the inhabitants of Achaia Propria, a Peloponnesian state This republic was not considerable in early times for the number of its troops, nor for its wealth, nor for the extent of its territories; but it was famed for its probity, its justice, and its love of liberty Its high reputation for these virtues was very ancient The Crotonians and Sybarites, to re-establish order in their towns, adopted the laws and customs of the Achæans After the famous battle of Leuctra, a difference arose betwixt the Lacedæmonians and Thebans, who held the virtue of this people in such veneration, that they terminated the dispute by their decision The government of the Achæans was democratical The arms which the Achæans chiefly used were slings They were trained to the art from their infancy, by slinging from a great distance, at a circular mark of a moderate circumference By long practice they took so nice an aim, that they were sure not only to hit their enemies on the head, but on any part of the face they chose Their slings were of a different kind from those of the Bæliarians, whom they far surpassed in dexterity

**ACHÆMENES** The most remarkable of this name is a king of Persia, among the progenitors of Cyrus the Great, his descendants were called Achæmenides, and formed a separate tribe in Persia, of which the kings were members Cambyzes, son of Cyrus, on his death-bed, charged his nobles, and particularly the Achæmenides, not to suffer the Medes to recover their former power, and abolish the empire of Persia

**ACHAIA**, a name taken for that part of Greece which Ptolem called Hellas the younger Pliny, Græcia, now called Livadia bounded on the north by Thessaly, the river Sperchius, the Sinus Maliacæ, and mount Oeta, on the west by the river Achelous, on the east turning a little to the north, it is washed by the Archipelago, down to the promontory of Sunium, on the south, joined to the Peloponnesus, or Morea, by the isthmus of Corinth, five miles broad See LIVADIA

**ACHAIA PROPRIA** anciently a small district in the north of Peloponnesus, running westward along the bay of Corinth, and bounded on the west by the Ionian Sea, on the south by Elis and Arcadia, on the east by Sicyonia inhabitants, the Achæans, properly so called,

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its metropolis Patræ It is now called Romania Alta, in the Morea

Achaia was also taken for all those countries that joined in the Achæan league, reduced by the Romans to a province Likewise for Peloponnesus

**ACHANIA** In botany, a genus of the class and order monadelphæa, polyandria, thus generically characterised Calyx double, the outermost many-leaved, corol convolute, and closed, stigmas, ten, berry, five celled, five-seeded It is a native of South America, and the West Indian islands, and only three species of it have been discovered a malvaviscens, a mollis, and a pilosa

**ACHAT**, in law, implies a purchase or bargain hence, purveyors were formerly called achators, from their making bargains

**ACHATES** (αχαιτης, from a river of that name where it is found, or αχος, a cure, as being efficacious in medicine) The achates, or agate

**ACHATONYX** (αχατονυξ) A species of agate mixt with onyx

**ACHE** s (ice, Saxon, ἀχος, Greek) A continued pain (*Shakspeare*)

To **ACHE** v n To be in pain (*Glanv*)

**ACHELOUS**, in fabulous history, wrestled with Hercules, for no less a prize than Deianira, daughter to king Oeneus but as Achelous had the power of assuming all shapes, the contest was long dubious at last, as he took that of a bull, Hercules tore off one of his horns, so that he was forced to submit, and to redeem it by giving the conqueror the horn of Amalthea, the same with the Cornucopia, or horn of plenty, which Hercules having filled with a variety of fruits, consecrated to Jupiter Some explain this fable by saying, that Achelous is a winding river of Greece, whose stream was so rapid that it roared like a bull, and overflowed its banks, but Hercules by bringing it into two channels, broke off one of the horns, and so restored plenty to the country

**ACHEM**, a large country of the East Indies, north of the kingdom of Ava, very little known to Europeans

**ACHEM**, the capital of the island of Sumatra, East Indies This city is large and populous, the houses are ascended by steps and ladders, being built on piles which are about two feet above the level of the ground, because in the rainy season the city is much overflowed The Europeans who inhabit this place, are chiefly English Dutch, Danes, and Portuguese, who with the Guzurats and Chinese, are the principal traders The natives are very jealous of the Europeans, and always go armed Lat 5 22 N Lon 95 40 E

**ACHFRNER** a star of the first magnitude, in the southern extremity of the constellation Eridanus, invisible in our latitude See ERIDANUS

**ACHERON**, in heathen mythology, a river of Epirus, which according to some, rose out of the lake Acherusia in Epirus, and emptied

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itself into the bay of Ambracia Others make it a sulphureous stinking lake near cape Misenum, in the bay of Naples The poets feigned it to be the son of Titan or Terra, or as others say, of Ceres, and that he was born in a cave without a father, and sent to hell for furnishing the Titans with water during their war with the gods, where he was turned into a river, over which departed souls were ferried

**ACHERSET**, an ancient measure of corn, conjectured to be the same as our quarter, or eight bushels

**ACHIAR**, a Malayan word, which signifies all sorts of fruits and roots pickled with vinegar and spice

**ACHICOLUM**, the sweating room, or *sudatorium*, of the ancient baths

To **ACHIEVE** *v a* (*achever*, Fr) 1 To perform, to finish (*Dryden*) 2 To gun, to obtain (*Milton*)

**ACHIEVEMENT** *s* (*achievement*, Fr) 1 The performance of an action (*Spenser*) 2 The escutcheon, or ensigns armorial (*Dryden*)

**ACHIEVFR** *s* (from *achieve*) He that performs what he endeavours after (*Shakspeare*)

**ACHILIFA** Yarrow, or milfoil a genus of the I nnean class and order *Angeneis* superflua, whose character is as follows Receptacle chafly, downless, clyx ovate, imbricate, unequal, florets of the ray from five to ten, inversely heart-shaped, or roundish Its species are very numerous, not less than forty-five having been already detected and described, which may be arranged into those with undivided leaves, with pinnatifid or feather cleft leaves, with pinnate leaves and flat leaflets, with pinnate leaves, the outermost leaflets confluent, with leaves doubly pinnatifid or feather cleft

The species are all natives of Europe, chiefly of the southern parts but with respect to the greater number of them, not difficult to be met with in any part A purpurea, or sweet wort and a milfolium, common yarrow, are the most commonly found in our own country, the former inhabiting our groves and forests, the latter our wastes and commons

**ACHILIFA ACERATUM** (*αχιλλια* from Achilles, who is said to have cured Ielphus with it) The systematic name for the aceratum of the pharmacopoeia

**ACHILLEA FOLII PINNATIS** True genti, which see

**ACHILLEA MILLEFOLIUM** The systematic name for the milfolium of the pharmacopoeia See **MILLEFOLIUM**

**ACHILLEA PTARMICA** The systematic name for the **PHARMACEUTIC PTARMICA**, which see

**ACHILLEID** **ACHILLEIS**, a celebrated poem of Statius, in which that author proposed to deliver the whole life and exploits of Achilles but being prevented by death, he has only

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treated of the infancy and education of this hero

**ACHILLES**, the son of Peleus and Thetis, was the bravest of all the Greeks in the Trojan war During his infancy, Thetis plunged him in the Styx, and made every part of his body invulnerable, except the heel, by which she held him His education was entrusted to the centaur Chiron, who taught him the art of war, and made him master of music He was taught eloquence by Phoenix, whom he ever after loved Thetis, to prevent him from going to the Trojan war, where she knew he was to perish, privately sent him to the court of Lycomedes, disguised in a female dress By his familiarity with the king's daughters here, he made Deidamia mother of Neoptolemus As Troy could not be taken without Achilles, Ulysses went to the court of Lycomedes in the habit of a merchant, and exposed jewels and arms for sale Achilles, choosing the arms, discovered his sex, and went to war Vulcan, at the entreaties of Thetis, made him a strong armour, which was proof against all weapons He was deprived by Agamemnon of his favourite mistress Briseis, who had fallen to his lot at the division of the booty of Iyrnessus For this affront, he refused to appear in the field till the death of his friend Patroclus recalled him to action, and to revenge (*Vide PATROCLUS*) He slew Hector, the bulwark of Troy, tied the corpse by the heels to his chariot and dragged it three times round the walls of Troy After thus appeasing the shades of his friend, he permitted old Priam to carry away Hector's body In the tenth year of this war, Achilles was charmed with Polyxena, and as he solicited her hand in the temple of Minerva, it is said that Paris aimed an arrow at his vulnerable heel, of which wound he died His body was buried at Siguin, and divine honours were paid to him, and temples raised to his memory Some ages after the Trojan war, Alexander, going to the conquest of Persia, offered sacrifices on the tomb of Achilles, and admired the hero who had found a Homer to publish his fame to posterity Achilles is supposed to have died 1183 years before the Christian era

**ACHILLIS**, a name given by the schools to the principal argument alleged by each sect of philosophers in behalf of their system In this sense we say this is his Achillis, that is, his matter-proof alluding to the strength and importance of the hero Achilles among the Greeks Zeno's argument against motion is peculiarly termed Achilles That philosopher made a comparison between the swiftness of Achilles, and the slowness of a tortoise, pretending that a very swift animal could never overtake a slow one that was before it and that therefore there is no such thing as motion for, said he, if the tortoise were one mile before Achilles, and the motion of Achilles one hundred times swifter than that of the tortoise, yet he would never

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overtake it, and for this reason, namely, that while Achilles runs over the mile, the tortoise will creep over one hundredth part of a mile and will be so much the foremost again while Achilles runs over this 100th part, the tortoise will creep over the 100th part of that 100th part, and will still be this last part the foremost, and so on continually, according to an infinite series of 100th parts from which he concluded that the swifter could never overtake the slower in any finite time, but that they must go on approaching to infinity. But this sophism lay in Zeno's considering as an infinite time the sum of the infinite series of small times in which Achilles could run over the infinite series of spaces,  $1 + \frac{1}{100} + \frac{1}{100^2} + \frac{1}{100^3} + \dots$  &c not knowing that the sum of this infinite series is equal to the quantity  $1\frac{1}{99}$  of a mile, and that therefore Achilles will overtake the tortoise when the latter has crawled over  $\frac{1}{99}$ th of a mile. Nay though we should grant, contrary to what is just shewn, that Achilles would never pass by the snail, yet it would not follow that there would be no motion for each of them would, even according to Zeno's statement, approach nearer and nearer to the other which could not be the case unless there was motion in one or in both.

**ACHILLES TIENDO** London of Achilles (So called from the fable that Thetis the mother of Achilles held him by this part of his body when she dipped him in the river Styx to make him invulnerable. Homer describes this tendon, but the immediate cause of its assuming the name of the Grecian hero is still uncertain). The strong tendon of the gastrocnemius and soleus muscles, which is inserted into the heel. See **GASTROCNEMIUS** and **SOLEUS**.

**ACHILINI** (Alexander) an eminent philosopher and physician, of Bologna where he died in 1512 aged 40. He is said to have discovered the malleus and incus, two small bones in the organ of hearing. His works were published in folio at Venice, in 1545.

**ACHIMBASSI** the name of an officer who presides over the practice of medicine at Cairo.

**ACHIROPTOS** a name given by ancient writers to certain marvellous pictures of Christ and the Virgin supposed to have been made without hands.

**ACHIVI** the name of the inhabitants of Argos and Iacedemon before the return of the Heraclidae by whom they were expelled from their possessions eighty years after the Trojan war. The appellation of Achivi is indiscriminately applied by the ancient poets to all the Greeks (*Paus. &c*).

**ACHOR**, in mythology, the god of flies.

**ACHMILLA** The herb and seeds of this plant, *spilanthus achmilla* of Linnæus, *spilanthus folius ovatus*, scabrous, caule erecto, floribus radiatis, are employed in cases of calculus of

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the kidneys and urinary bladder. It is extremely bitter and balsamic and is given in the form of infusion. See **SPILANTHUS**.

**ACHORIS**, (*achores*, pl. m. from *achor*, quasi *αχρως*, from *αχρως*, brain, from the brainy scales thrown off). A disease which attacks the hairy scalp of the head, for the most part of young children, forming soft and scaly eruptions.

**ACHRAS SAPOTA** A genus of the Linnean class and order hexandria monogynia, thus characterised calyx six-leaved, corol ovate, six-cleft with as many alternate inter or scales point, ten-celled, seeds solitary, with a marginal scar and process at the top. There are only three known species, one of which has been traced in the Friendly Islands, and the other two in South America.

**ACHROMATIC** an epithet expressing want of colour. The word is Greek, being compounded of *a* privative, and *χρως*, colour. The term was first applied to telescopes by Dr Brewster.

**ACHROMATIC TELESCOPES**, are telescopes contrived to remedy the aberrations in colours. One of the inventors of this kind of telescopes was the late Mr John Dollond, optician to the king. They have been improved by his son, and by other persons. Every ray of light passing obliquely from a rarer into a denser medium changes its direction towards the perpendicular, and every ray passing obliquely from a denser into a rarer medium, changes its direction from the perpendicular. This bending of the rays caused by the change of its direction is called its refraction, and the quality of light which subjects it to this refraction is called its refrangibility. Every ray of light, before it is refracted is white, though it consists of a number of component rays each of which is of a different colour. As soon as it is refracted, it is separated into its component rays which, from that time proceed diverging from each other, like rays from a centre and this divergence is caused by the different refrangibility of the component rays, in such sort that the more the original or component ray is refracted the more will the compound rays diverge when the light is refracted by one given medium only. From hence it has been concluded, that any two different mediums that can be made to produce equal refractions will necessarily produce equal divergencies whence it should also follow, that equal and contrary refractions should not only destroy each other, but that the divergence of the colours caused by one refraction, should be corrected by the other and that to produce refraction that would not be affected by the different refrangibility of light is impossible. But Mr Dollond has proved, by many experiments, that these conclusions are not well founded from his experiments it appeared, that a ray of light, after equal and contrary

## ACHROMATIC TELESCOPES

refractions, was still spread into component rays differently coloured in other words, that two different mediums may cause equal refraction, but different divergency, and equal divergency, with different refraction. It follows therefore that refraction may be produced, which is not affected by the different refrangibility of light. In other words, that, if the mediums be different, different refractions may be produced, though at the same time the divergency caused by one refraction shall be exactly counteracted by the divergency caused by the other, and so in object may be seen through mediums, which together cause the rays to converge, without appearing of different colours. This is the foundation of Mr Dollond's improvement of refracting telescope. By subsequent experiments, he found that different sorts of glass differed greatly in their refractive qualities, with respect to the divergency of colours. He found that crown glass causes the least divergency, and white flint the most, when they are wrought into forms that produce equal refractions. He ground a piece of white flint glass into a wedge, whose angle was about 20 degrees, and a piece of crown glass to another whose angle was about 29 degrees, and then he found refracted nearly alike, but that their divergency of colours was very different. He then ground several other pieces of crown glass to wedge of different angles, till he got one that was equal in the divergency it produced to that of a wedge of flint glass of 20 degrees, so that when they were put together, in such a manner as to reflect in contrary directions the refracted light was perfectly free from colour. Then measuring the refraction of each wedge, he found that that of the white flint glass, was to that of the crown glass nearly as two to three. And hence any two wedges, made of these two substances, and in this proportion, would when applied together so as to reflect in contrary directions reflect the light without any effect arising from the different refrangibility of the component rays. Therefore, to make two spherical glasses that reflect the light in contrary directions, one must be concave and the other convex, and as the rays after passing through both must meet in a focus, the excess of the refraction must be in the convex one, and as the convex is to reflect most, it appears from the experiment that it must be made of crown glass, and as the concave is to reflect least, it must be made of white flint. And further, as the refractions of spherical glasses are in an inverse ratio of their focal distances, it follows that the focal distances of the two glasses should be in the ratio of the refractions of the wedges; for, being thus proportioned, every ray of light that passes through this combined glass, at whatever distance from its axis, will constantly be refracted by the difference between two contrary refractions, in the proportion required, and therefore the effect of

the different refrangibility of light will be prevented. The removal of this impediment, however, produced another for the two glasses, which were thus combined, being segments of very deep spheres, the aberrations from the spherical surfaces became so considerable, as greatly to disturb the distinctness of the image. Yet considering that the surfaces of spherical lenses admit of great variations, though the focal distance be limited, and that by the variation their aberration might be made more or less at pleasure, Mr Dollond plainly saw that it was possible to make the aberrating of any two glasses equal, and that, in this case the refractions of the two glasses were contrary to each other, and their aberrations being equal, they would destroy each other. Thus he obtained a perfect theory of making object glasses, to the apertures of which he could hardly perceive any limits, for if the practice could come up to the theory, they must admit of apertures of great extent, and consequently bear great magnifying powers. The difficulties of the practice are, however, still very considerable. For first the focal distances as well as the particular surfaces, must be proportioned with the utmost accuracy to the densities and refracting powers of the glass, which vary even in the same sort of glass, when made at different times. Secondly, the three four surfaces to be wrought perfectly spherical. Still Mr Dollond could construct refracting telescopes upon these principles with such apertures and magnifying powers under limited lengths, as greatly exceed what were before produced, in the formation of images, bright, distinct and completely uncoloured about the edges. (Hutton's Dictionary.) The defects which were yet unremoved in Mr Dollond's telescope have called forth the execution of other philosophers, and many contrivances have been invented. Father Boscowich, to whom every branch of optics is much indebted, has in his attempts for this purpose, displayed much ingenuity, but the philosopher whose sections have been crowned with most success, and who has perhaps made the most important discovery in this branch of science since the time of Newton, is Dr Robert Blair, regius professor of astronomy in the college of Edinburgh. By a judicious set of experiments, ably conducted, he has proved that the quality of dispersing the rays in a greater degree than crown glass is not confined to a few mediums, but is possessed by a great variety of fluid, and by some of these in a most extraordinary degree. He has shown that although the greater refrangibility of the violet rays than of the red rays, when light passes from any medium whatever into a vacuum may be considered as a law of nature, yet in the passage of light from one medium into another, it depends entirely on the qualities of the mediums, which of these rays shall be the most refrangible, or whether there shall be any difference in their refrangibility.

bility. In order to correct the aberration arising from difference of refrangibility among the rays of light, he instituted a set of experiments, in the conducting of which he detected a very singular and important quality in the muriatic acid. In all the dispersive mediums hitherto examined, the green rays, which are the mean refrangible in crown glass, were found among the less refrangible, but in the muriatic acid, these same rays were by him found to make a part of the more refrangible. This discovery led to complete success in removing the great defect of optical instruments, viz. that dissipation or aberration of the rays which arises from their unequal refrangibility, and has hitherto rendered it impossible to converge all of them to one point either by single or opposite refractions. A fluid in which the particles of muriatic acid and metalline particles hold a due proportion, at the same time that it separates the extreme rays of the spectrum much more than crown glass, refracts all the orders of the rays in the same proportion that glass does; and hence rays of all colours made to diverge by the refraction of the glass, may either be rendered parallel by a subsequent refraction made in the confine of the glass and this fluid, or, by working up the refractive density of the fluid the refraction which takes place in the confine of it and glass may be rendered a regular as reflection, without the least colour whatever. The inventor has a telescope, not exceeding fifteen inches in length, with a compound object glass of this kind, which equals in all respects, if it does not surpass, the best of Dollond's forty-two inch long. Of this object glass a figure will be found in the third volume of the Transactions of the Royal Society of Edinburgh; and to that volume we must refer our readers for a full and picturesque account of the experiments which led to this discovery, as well as of the important purposes to which it may be applied. A judicious abridgement of this paper may be seen in Nicholson's Journal vol. 1. 4to p. 1—12. In the Gentleman's Magazine for 1790, (p. 890), there is a paper on the achromatic telescope, by a writer under the signature of Veritas, who ascribes the invention to a gentleman in whose name we have not yet mentioned in these words. "As the inventor has been claimed by M. Euler, M. Klingensterna, and some other foreigners, we ought for the honour of England, to assert our right and give the merit of the discovery to whom it is due, and therefore, without farther preface, I shall observe, that the inventor was Chester More Hall, Esq. of More Hall, in Essex, who about 1770, as appears by his papers, considering the different humours of the eye, imagined they were placed so as to correct the different refrangibility of light. He then conceived that if he could find substances having such properties as he thought where but our might possess, he should be enabled to construct an object glass that would show objects colourless. After many experi-

ments, he had the good fortune to find those properties in two different sorts of glass, and making them disperse the rays or light in different directions, he succeeded. About 1793 he completed several achromatic object glasses, (though he did not give them this name), that bore an aperture of more than two inches and a half, though the focal length did not exceed twenty inches, one of which is now in the possession of the rev. Mr. Smith, of Charlotte-street, Rathbone place. This glass has been examined by several gentlemen of eminence, and scientific abilities, and found to possess the properties of the present achromatic glasses. Mr. Hall used to employ the working opticians to grind his lenses, at the same time he finished them with the radius of the surfaces, not only to correct the different refrangibility of rays, but also the aberration arising from the spherical figure of the lenses. Old Mr. Bass, who at that time lived in Bridewell precinct, was one of these working opticians, from whom Mr. Hall's invention seems to have been obtained. In the trial at Westminster hall, about the patent for making achromatic telescopes, Mr. Hall was allowed to be the inventor; but Lord Mansfield observed that "it was not the person who locked up his invention in his scratory, that ought to profit by a patent for such an invention; but he who brought it forth for the benefit of the public." This perhaps might be said with some degree of justice. Is Mr. Hall was a possessor of property, and did not look to any pecuniary advantage from his discovery, and consequently it is very probable that he might not have an intention to make it generally known at that time. That Mr. Ayscough, optician at Ludgate-hill, was in possession of one of Mr. Hall's achromatic telescopes in 1794, is a fact which at this time will not be disputed.

#### ACHROMICAL See ACHROMATICAL.

ACHILLES, in geography, a small commodity has been near Inturman in the Black Sea.

ACHYRANTHUS In botany, a genus of the Linnaean class and order pentandria monogyna, thus generically characterised: calyx five-leaved, corollaless; stigma bifid; seeds solitary. The known species are sixteen which are found in the warmer climates of Asia, Africa, and America. No species has hitherto been detected of natural growth in any part of Europe.

ACHYRONIA A plant lately introduced into our green-houses from Botany-bay. In the Linnaean system it forms a genus in the class and order didadelphia decandria, the following is its generic character: Calyx five-toothed, the lower tooth elongated and cloven, legume closed compressed, many seeded. One single species of this plant is the whole that has yet been noticed by botanists.

ACHYROPHORUS In botany See HYPOCHOERIS.

ACIA In botany a genus of plants in the Linnæan class and order monadelphia dode-

candria, thus generically characterised: calyx five-parted, petals five, drupe dry, cartaceous, fibrous, one-seeded. There are only two species, both of which are natives of Guiana.

**ACICARPHA** In botany, a genus of the Linnéan class and order syngenesia polygama necessaria, thus characterised: receptacles chaffy, the chaff uniting with the seeds after flowering, downless, seeds naked, all the florets tubular, calyx five parted. The only species yet known is a native of Buenos Ayres, and was first described by Jussieu.

**ACICULAR, ACICULARI** In botany, shaped like a small needle. Also the trivial name of a small sharp pointed scurpus.

**ACID**, in chemistry, the generic name of a comprehensive class of salts, which possess the following properties: sourness of taste, a power of changing blue vegetable colours red, of forming with water a combination whose specific gravity is not a medium between the water and the acid, and of combining (and usually effervescing) with all the alkalis, and most of the metallic oxides and earths, by which means those compounds are formed which are called neutral, or secondary salts. Though every acid does not possess all these properties, yet they all possess a sufficient number of them to distinguish them from other substance. The form under which acids most commonly appear, is that of a transparent liquor, in which case they are generally combined with a greater or less quantity of water: several of them, however, are found in a solid state, which some have supposed is their natural condition. Since all acids resemble each other in so many particulars, it was natural to presume that they likewise resembled each other in their intimate nature, and possessed some homogeneous principle. \*Philosophers believed that there was only one acid principle in nature, which communicated taste and solubility to the bodies in which it was combined. Becher embraced the same opinion, and believed also, that this acid principle was a compound of earth and water, which he considered as two elements. Stahl adopted the theory of Becher, and endeavoured to prove that this acid principle was the sulphuric acid, of which, according to him, all the other acid were mere compounds. But his proofs were only conjectures or vague experiments, from which nothing could be deduced. Nevertheless his opinion, like every other which he advanced in chemistry, continued to have supporters for a long time, and was even countenanced by Macquer. At last its defects began to be perceived, Berzelius and Scheele declared openly against it, and their discoveries, together with those of the French chemists, notwithstanding the attempts of Monnet to support it, demonstrated the falshood of both parts of the theory, by shewing that sulphuric acid did not exist in the other acids, and that it was not composed of water and earth, but of sulphur and oxygen. The opinion, however, that acidity was owing to some common prin-

ciple, was not abandoned. Wallerius, Meyer, and Sage, had advanced different theories in succession about the nature of this principle, but as they were founded rather on conjecture and analogy, than direct proof, they obtained but few advocates. At last Lavoisier, by a number of ingenious and accurate experiments, proved that several combustible substances when united with oxygen, form acids, that a great number of acids contain oxygen, and that when this principle is separated from them, they lose their acid properties. He concluded, therefore, that the acidifying principle is oxygen, and that acids are nothing else than combustible substance combined with oxygen, and differing from one another according to the nature of the combustible base or radical of the acid, in opinion which almost every subsequent observation has confirmed, which scarcely any one has been found to oppose, and which therefore is deservedly most prevalent among chemists of the present day. The chief, and indeed the only objections hitherto known to this theory are first, that the prussic acid has not been proved to possess oxygen as one of its constituent parts: secondly, that it neither the muriatic, fluoric, nor boric acid, has hitherto been decomposed, we are ignorant of their respective natures. With regard to the first objection, however, it becomes us to observe, that if the experiments of Vanquelin and Lavoisier have not been quite decisive that the prussic acid contains oxygen, they are very nearly, and in the opinion of Lavoisier himself perfectly so, and that it is highly probable additional experiments now making upon this substance will very shortly remove every shadow of doubt from the bottoms of the most sceptical. With regard to the three other acids it is for the present sufficient to remark, that since every acid which has been analysed, (if we except the prussic), is known to consist of oxygen and a combustible base, either simple or compound, it is certainly consistent with the principle of philosophy to assume that as a general law which is founded upon general experiments, and which, if not universally confirmed, has in no instance been contradicted. Such then is the theory of Lavoisier, the most beautiful simple and satisfactory that has yet been advanced on the subject.

There are two methods of acquiring a knowledge of the nature of acids: one, by forming them from their constituent parts, or uniting

\* We cannot here introduce any kind of reasoning upon the very curious series of experiments in which Mr. Davy is engaged on the nature of alkalis, which have also been found, so far as he has decomposed them to contain a considerable portion of oxygen. We shall probably give the result, and offer some observations upon the general change which such experiments are likely to produce in the science and system of chemistry, in a Supplement to this work, unless they should be so speedily completed as to enable us to examine them in the article OXYGEN.



## A C I D

with oxygen such substances as are capable of becoming acid by a union with it, the other, by decomposing them, or depriving them of their oxygen by the aid of substances with which this principle has a greater affinity. By the last of these methods, as has been shown above, it has been proved in a great variety of instances, that oxygen is the principle of acidity, and by the first, the same truth has been made equally clear, for on combining various substances with oxygen, the particular acids were produced which are distinguished by the names of those substances. Assuming it then as a fact for the present, that oxygen is common to all acids, and the cause of their acidity, we proceed to observe that there are three states in which acids may exist, occasioned by the different degrees in which the acidifiable base is combined with oxygen. In the first they contain the least possible quantity of oxygen to render them acid, and are designated in the reformed chemical nomenclature by the termination *ous*; thus we see, the sulphurous, nitrous, phosphorous, or acteous acid. The second state of acids, is that in which they contain more oxygen, and in general are completely saturated with it: this state is expressed by the termination *ic*, as the sulphuric, nitric, phosphoric, or acetic acid. In the third state they contain in excess of oxygen when they are said to be oxygenated, and are distinguished by the prefix *oxy*, as oxy-muriatic acid. When metallic and other substances are combined with a less proportion of oxygen than is sufficient to render them acid, they are said to be oxidated, and the substances produced are called oxids. Acids with different proportions of oxygen, may be formed by uniting the radical with such determinate quantities of it as are necessary to convert them into the state required, as is done with sulphur, phosphorus or arsenic or by extracting from acids fully saturated with oxygen, sufficient proportions of this principle, by means of combustible substances which absorb it with avidity. The latter method is often used to decompose acids, by depriving them of all the oxygen they contain: hot charcoal is employed for this purpose, and most of the metals, phosphorus, sulphur and hydrogen in a dry solid state may exist in vegetable compounds, possess the same property. Formerly acids were divided into mineral, vegetable, and animal according to their supposed origin, this division is all retained by some, though it is incorrect, is many of them are found in all the three natural kingdoms. The most judicious method, perhaps, is to arrange them in four classes, according to their bases or radicals. First, those with simple radicals, of different kinds. Secondly, those with double radicals, viz carbon and hydrogen, in different proportions. Thirdly, the compounds with triple radicals, carbon, hydrogen, and azote. And fourthly, those with unknown radicals. The old chemists were only acquainted with the three mineral acids as they are called, the

ulphuric, the nitric, and the muriatic, beside the acetous acid, or vinegar. The moderns have very much increased the number, as will appear by the following alphabetic list.

### TABLE OF ACIDS

*Acetic acid*, or radical vinegar, is composed of 50.19 parts of oxygen, 13.94 of hydrogen, and 35.87 carbon, in 100 parts of acid. Its taste is extremely sour, its odour penetrating, and its specific gravity 1.0626, that of water being 1.0000.

*Acetous acid*, or distilled vinegar, is usually supposed to be different from the preceding, in containing a less proportion of oxygen, and exhibiting other properties, but Gren, Adet, Darraq, and Proust, have rendered it probable that it is the same acid in a less degree of concentration or with the addition of water and mucilaginous matter.

*Amniotic acid*, first obtained from the liquor in the amnios of the cow, whence its name. Taste, slightly acid.

*Arsenic*, composed of 34.6 parts of oxygen, and 65.4 of arsenic. Specific gravity, 3.391. Taste, when solid, very slight, but dissolved in water, very acid.

*Arsenous acid*, or white oxyd of arsenic, is less oxygenated than the former, and has a weak sub acid taste.

*Benzoic*, obtained by sublimation from the resinous substance called benzoin or benjamin, is composed of oxygen, hydrogen, and carbon in proportion unknown. Taste, acid and hot. Specific gravity, 0.667.

*Bombic*, from the chrysalis of the silk-worm. Nature not known.

*Boracic*, from borax, though frequently examined, it has never been decomposed its composition is therefore unknown to us. Taste, first sourish, then rather bitter, afterwards sweet. Specific gravity, 1.479 in scales, 1.903 in fusion.

*Camphoric*, from camphor, taste acid and sonewhat bitter. Supposed by some to be the same with the benzoic, and by others considered as a distinct acid.

*Carbonic*, formed by the union of eighty-two parts of oxygen and eighteen of carbon. Specific gravity, in the state of gas, 0.018, of water saturated with it 1.001.

*Chromic*, contains thirty-three parts of the metal chromium, and six or seven of oxygen. Taste acid. Crystals of a ruby red colour.

*Citric*, composed of oxygen, hydrogen, and carbon, proportion not known. Taste, very acid.

*Columbic*, exists in the ore of columbium, and is composed of that metal and oxygen.

*Fluoric*, is obtained from fluor-spars, its composition is unknown. The distinguishing property of this acid is that of corroding glass and siliceous bodies. Specific gravity, 1.500.

*Formic*, or acid of ants, is now discovered to be a mixture of acetic and malic acids.

*Galluc*, composed of oxygen, hydrogen, and

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a great proportion of carbon. When pure, it is in the form of transparent plates. Taste, acid, and somewhat astringent.

**Lactic**, from white lie, composed of the same ingredients as the preceding, in different proportions, form, liquid, sp gr 1.025, at 70°.

**Lactuc**, from the whey of milk, is also composed of oxygen, hydrogen, and carbon. Taste, sour, form, solid, but becomes liquid by attracting moisture.

**Lithic**, obtained by distilling the urinary calculus, is solid and crystalline. It is on account of its origin, often called uric.

**Malic**, from the juice of apples, &c. is composed of oxygen, hydrogen, and carbon, form liquid, of reddish colour, taste, very sour.

**Melatic**, from honey stone, consists of the same ingredients as the former. In many respects it resembles the oxalic.

**Molybdic**, composed of molybdenum and oxygen, is a white powder of a sharp, metallic taste. Specific gravity 3.4.

**Mucic**, or mucous, obtained by treating gum-arabic, &c. with nitrous acid, from its having been first procured by treating sugar of milk in a similar manner, it is called saccholactic acid. Its form is that of a white gritty powder, taste, slightly acid. Composed of oxygen, hydrogen and carbon. Specific gravity of its solution in water, 1.0015.

**Muriatic** composition not clearly ascertained. In its pure state or that of gas, its taste is very acid, and its specific gravity, 0.02315, nearly double the weight of common air, in its liquid state when absorbed by water, its specific gravity is 1.500. Oxy-muriatic acid contains more oxygen than the former, being composed of sixteen parts of oxygen, and eighty-four of acid. Form gaseous, taste, astringent. Specific gravity of water saturated with it 1.003. \*This is rather an oxyd than an acid. Hyperoxy-muriatic acid contains still more oxygen, being formed of sixty-five parts of it to thirty-five of muriatic acid. It has not yet been procured in a separate state.

**Nitric**, from nitre, is composed of eight and a half parts of oxygen to twenty-nine and a half of nitrogen. Form liquid, taste, very acid and peculiar, specific gravity, 1.1040 to 1.063.

**Nitrous** composed of nitric acid and nitrous gas, specific gravities from bluish green 1.475, to yellow 1.502.

**Nitro-muriatic** (of aqua regia), is a combination of nitrous and muriatic acids, or rather of these two and oxy-muriatic.

**Oxalic**, composed of seventy-seven parts of oxygen, ten of hydrogen, and thirteen of carbon. Taste, very acid, specific gravity of a saturated solution in water of 60°, 1.0593.

**Phosphoric**, consists of about sixty parts of oxygen, to forty of phosphorus. Taste, very acid, specific gravity when dry, 2.697. In the state of gas, 2.8516. In that of deliquescence, 1.417. It is obtained from animal, vegetable, and even mineral substances.

**Phosphorous**, contains less oxygen than the preceding. Proportion not known.

**Prussic**, composed of hydrogen, azote, and carbon. The existence of oxygen in this acid has not been clearly proved. Form, liquid, colourless, taste, sweetish, acid, and lot. Oxy-prussic, is a combination of this with oxygen.

**Pyrolignous**, **Pyromucous**, and **Pyrolaric** acids obtained by distillation from wood, sugar, and tartar respectively, are now ascertained to be merely acetic acid, holding in solution a portion of empyreumatic oil. Previously they were considered as distinct and peculiar.

**Rosaceu**, so called from its colour, is obtained from the laticious sediment deposited by urine in fever, or during the paroxysm of the gout.

**Saccholactic**. See **Mucic**.

**Sulcric**, from tallow or fat, composed of oxygen, hydrogen, and carbon. In appearance resembling fat, taste slightly acid. It is equally obtained from animal and vegetable substances.

**Sulcric**, from cork, form solid or powdery, taste, acid, and slightly bitter.

**Succinic**, from amber, form solid, taste, strongly acid, composed of oxygen, hydrogen, and carbon.

**Sulphuric**, composed of 38 parts of oxygen, and 61 of sulphur, form, liquid, taste, strongly acid. Specific gravity when much concentrated, 1.85 to 2.000.

**Sulphurous**, composed of thirty-two parts of oxygen, and sixty-eight of sulphur, specific gravity of gas, 0.040 (*Bergman*) or 0.0251 (*Lavoisier*), of liquid, in water saturated with it, 1.0113 (*Thomson*).

**Tartaric**, from tartar, &c. is composed of 70 parts of oxygen, nineteen of carbon, and 10 of hydrogen, form solid, specific gravity 1.5062. Dissolved in water 1.230, taste, exceedingly sour.

**Tartaric**, composed of twenty parts of oxygen and eighty of the metal tungsten, form, white powder, no taste, specific gravity about 6.1.

**Zoonic**, from animal fibres, or the gluten of wheat, &c. is nothing more than acetic acid, holding in solution an animal matter resembling oil.

Other acids have been mentioned by various authors, particularly those from metals, such as auric, bismuthic, &c. &c. the same platinum, &c., but then acid characters are very ambiguous. Indeed they are rather to be considered as metallic oxids, than as acids. The specific gravity of water being 1.000 and that of atmospheric air 0.012, it is easy to discern from the above table, as far as the specific gravities of acids are determined, which of the fluids are heavier than water, and which of the gases are heavier than common air, and vice versa. These acids will be described under their specific names.

The medical uses of acids are considerable and important. In various forms and combinations

they are employed internally, as tonics, antiseptics, and febrifuges. They give additional action to the stomach, and probably promote the secretion of gastric juice. scorbutic affections seem often to fly before them. As though they were a specific remedy, or positive antidote, combined or neutralized with alkalis, they diminish febrile thirst, and excite salutary perspiration, and as an ingredient in ptisans, add equally to the agreeableness of their flavour, and their intension as sedatives. Externally they are applied as astringents and corroborants to parts debilitated by accidents, as antiseptics to parts that are splenelated or gangrenous, and as refrigerants to parts that are inflamed. In a highly concentric state, they are supposed to change the nature of the miasmatic septon in typhous, and other putrescent fevers, and for this purpose have, of late, been very generally employed in the form of vapour, especially the nitric and muriatic acid. On these accounts, many of the acids enumerated in the preceding catalogue, have retained a place or found an introduction into the pharmacopæias of the royal medical colleges, both of London and Edinburgh, in which they occur under the following names, and for the following purposes.

*Acidum muriaticum* Spiritus salis marini Gläuben's Muriatic acid. Marine acid. Spirit of salt. Muriatic acid is much esteemed as an antiseptic, and therefore given with bark, &c. in putrescent diseases. It, however, mostly proves purgative. A celebrated physician on the continent, whose success in curing typhoid fevers was unvalued, lately published his method of cure, in consequence of a handsome annuity from the king of Prussia, which consisted in giving very large doses of this acid.

*Acidum nitricum* Nitric acid. This acid has lately been extolled as an antisiphilitic. It may be given with advantage in mild cases of syphilis and rheumatism, as an antiseptic it stands first in the catalogue. Infusion of roses made with it in the place of vitriolic acid is a valuable medicine.

*Acidum nitrosum* Spiritus nitri fumans. The nitrous acid possesses the same properties as the nitric, but in a much inferior degree.

*Acidum sulphuricum* See *Acidum vitriolicum*.

*Acidum perlatum* Perlatic acid, or acid of pearls. A preparation much vaunted formerly but now ascertained to be nothing more than phosphoric acid, separated by re-agents from human urine. Morveau, however, like Berghman, thinking it a peculiar acid, named it in his *Encyclopædia*, "the diuretic or urætic acid."

*Acidum nitrosum dilutum* Aqua fortis. Diluted nitrous acid possesses the same properties as the nitrous acid, but in an inferior degree.

*Acidum vitrioli aromaticum* Elixir vitrioli aromaticum. A stimulant and stomachic preparation of the Edinburgh pharmacopœia, for which the London college has substituted the *acidum vitriolicum dilutum*.

*Acidum vitriolicum* Vitriolic acid of the pharmacopœias, is termed *acidum sulphuricum* in the new chemical nomenclature. It is highly esteemed as an antiseptic and antiphlogistic, and is therefore exhibited in synochus, cynanche, scrophula, &c. See *Sulphuric acid*.

*Acidum vitriolicum dilutum* The virtues of this preparation are the same as those of the *acidum vitriolicum*, only in a much inferior degree.

**ACIDIFIABLE BASE, or RADICAL**, in chemistry, is any substance, whether simple or compound, that is capable of uniting with such a quantity of oxygen, as thereby to form an acid. This union must take place without decomposing the base. From our account of acids (see *ACIDS*), it will be seen that acids agree in containing oxygen, but differ in their radicals; it is the radical, therefore, or the acidifiable base, that determines the species of acid, and is employed at present to denote it. This mode of expression, however, is not general. For instance, those acids which are called the benzoic, the succinic, and the sebatic, are not formed by the union of benzoïn, rubber, and fat with oxygen, as their names would indicate, but are really only part of those substances, and are separated from them by different processes. The new chemical nomenclature has contributed very much to systematic and improve the language of chemistry. Its object is, as much as possible, to assign such names to bodies as shall clearly distinguish those that are simple, and denote the composition of those that are compound, but it is not yet capable of a universal application. In the instances adduced, the radicals of some of the acids are not known, and therefore the rules of the nomenclature could not be employed in the formation of their names, which are expressed by those of the substances in which the acids are found. See **NOMENCLATURE**.

**ACIDIFICATION**, the act or process of rendering any substance acid.

**ACIDITY**, the quality which constitutes a body acid, or that sensation of sharpness and sourness which acids excite upon the organs of taste.

**ACIDOION** In botany, a genus of the Imanian class and order monocœia hexandria, thus generically characterised. Male, calyx five leaved, corollless, stamens numerous, fixed to a globular receptacle. Female, calyx six leaved, corollless, style three-cleft, capsule three celled. It is a native of Jamaica, and but one species only has yet been explored.

**ACIDNESS** See **ACIDITY**.

**ACIDULATED WATERS**, generally called **ACIDULÆ**, a species of mineral waters, which contain a considerable quantity of carbonic acid, and which are known by the pungency of their taste, the sparkling appearance which they assume when shaken or poured from one vessel into another, and the facility with which they boil.

## ACI

**ACIDULOUS**, a term used to denote any thing which is slightly acid

**ACIDULUM**, in chemistry, a term expressing a genus of native salts, composed of acid salts, united with a certain quantity of potash, or those in which the alkaline base is supersaturated with acid There are two species of acidulae, the tartareous and the oxalic, the first, which is known by the name of cream of tartar, will be described under the article **ACIDULOUS TARTRITE OF POTASH** and the second, commonly called salt of creel, under **ACIDULOUS OXALATE OF POTASH**

**ACIDUM PINGUI**, *Causticum*, in chemistry, an unimpaired agent or principle, proposed by Frederic Meyer, in apothecary of Os-naburg to explain the causticity of quick lime and other phenomena of chemistry But is the operation of this principle is extremely confused, and the properties ascribed to it are often contradictory, it is now exploded A further account of it may be seen in Macquers's Chemical Dictionary

**ACINACIS**, a kind of scymitar recently used in Persia

**ACINACHORMIFACE** (*Iolium acinaciforme*) In botany, fleshy compressed, one edge convex and hump the other straight and thicker, resembling a scimitar, or scymitar As in Mesembryanthemum acinaciforme

**ACINI** (*ακνίαι*, from *ακνί*, a point) In botany, clustering, or granulung prominences in berries, as for instance those in the mulberry, or blackberry also the kernels of the grape and hence in anatomy applied to glands, which exhibit a similar configuration

**ACINIFORM TUNIC** (*Tunica aciniformis*) The uvea, or posterior lumina of the iris, because in hue, which the ancients chiefly dissected, it is of the colour of unripe grape See **ACINI**

**ACINODENDRON** American gooseberry See **MELASTOMA**

**ACINOS** Will or stone brasil See **THYMUS**

**ACIPENSER** In ichthyology, the sturgeons The sixty sixth genus of order VI or chondropterygii, in the Imrean class fishes The following is its character Head obtuse, mouth beneath the head, reticulate, without teeth Error between the end of the snout and the mouth four apertures of the gills on each side body elongated, annulate with numerous rows of large bony plates The acipenser, or sturgeon, may be ranked among the larger fishes is an inhabitant of the sea but ascends rivers annually, its flesh, throughout all the species is delicious from the roe is made caviare, and from the sound and muscular parts ismglass It feeds on worms and other fishes The female is larger than the male It comprises five species 1 a sturio (common sturgeon) (see **NATURAL HISTORY**, plate 1) 2 a scypa, 3 a iuthenu 4 a stellatus, 5 a huso

## ACO

**ACTIS**, in fabulous history, the son of Faunus and Simethis, was a beautiful shepherd of Sicily who being beloved by Galatea, Polyphemus the giant was so enraged, that he dashed out his brains against a rock after which Galatea turned him into a river, which was called by his name

**ACTIS** (Ovid, *Theocentus*) a river of Sicily, running from a very cold spring, in the rocky and shady foot of mount *Actna*, eastward into, and not much above a mile from, the sea, along green and pleasant banks, with the speed of torrents, from which sometimes it takes its name It is now called *Acta* or *Chiacti*, according to the different Sicilian dialects Also the name of a hamlet at the mouth of the *Actis*

**ACLIDIS**, in Roman antiquity, a kind of missile weapon, with a thong fixed to it, whereby it might be drawn back again

**1** **ACKNOWLEDGE** *ακνί* 1 To own the knowledge of, to own any thing or person in a particular character (*Devot*) 2 To confess, as a fault (*Psalm*) 3 To own, as a benefit (*Milton*)

**ACKNOWLEDGING** *ακνί* (from *acknow* *led*) Grateful (*Dryden*)

**ACKNOWLEDGMENT** *ακνί* 1 Admission of any character in another (*Hale*) 2 Confession of the truth of any position (*Hooker*) 3 Confession of a fault 4 Confession of a benefit received (*Dryden*) 5 Act of restitution to any concession, such is how *α* (*Spenser*) 6 Something given or done in confession of a benefit received (*Example*)

**ACKWORTH** a small village near Pontefract in York shire celebrated for the benevolent institution established there by the late Dr Fothergill at which more than 300 children of Quakers are educated under the same roof

**ACML** *ακμλ* *ακμλ* The height of any thing, more especially used to denote the height or crisis of a distemper (*Quincy*)

**ACNI** (*ακνί*, *chuff*) A small tubercle covered with a blemish scale

**ACNISIS** (*ακνίσις*, from *ακνί* and *ακνίσις*, to scratch) That part of the space between the shoulder-blades and the commencement of the loins So called from the difficulty of reaching and scratching it

**ACNIDA**, **ACNIDE** Virginian hemp A genus of the Imrean class and order dicotyledon pentandria, the male plant, calyx five-leaved, corollae The female calyx two-leaved, corollae, styles three, one erect, covered with the succulent calyx A single species alone is known to botanists, which is a native of the country whence it derives its English name

**ACOLIOUS** (*ακολίος*, *ακολίος*, from *ακνί* and *ακολίος*, the belly) Thin, emaciated, bellyless

**ACOLITAE**, or **ACOMETI** in church history, a set of monks who chanted the divine

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service night and day in their places of worship. They divided themselves into three bodies, who alternately succeeded one another so that their churches were never silent. This practice they founded upon the precept, *Pry without ceasing*. They flourished in the East about the middle of the fifth century.

**ACOLUTHI**, or **ACOLUTHISTS**, in antiquity, an appellation given to those persons who were steady and immovable in their resolutions and hence the stoics, because they would not forsake their principles, acquired the title of *Acoluti*. The word is Greek, and compounded of *a priv* and *κολυθω*, *to turn*, as never turning from the original course.

**ACOLUTHI**, among the ancient Christians, implied a peculiar order of the inferior clergy in the Latin church. At their ordination, a taper was given them, thereby to understand, that they were appointed to light the candles of the church as also an empty pitcher to imply that they were to furnish wine for the church.

**ACOLYTHIA**, denotes the office or order of divine service, or the prayers, ceremonies, hymns, &c. of the Greek church.

**ACON**, an ancient instrument like the citharus.

**ACONDYLOUS** (*αcondyλος*, from *a priv* and *κondyλος*, *a joint*) In botany, a term applied to a flower whose stalk is not divided by joints.

**ACONITIF**. See **ACONITUM**.

**ACONITE WINTER**. See **HELLBORUS**.

**ACONITI**, in antiquity, a term applied to some of the Athletics. Its import is not now well known.

**ACONITOPHYUM** (from *aconitum*, wolf's bane, and *folium*, a leaf) Duck-foot. A herb whose leaves resemble wolf's-bane.

**ACONITUM** (*De coride* derives this word from *a priv* and *κοινος*, the herb having been used medicinally to quicken the sight. By others it is said from *a priv* and *κοινος*, whence it being joined to thyme in barren and rocky places.) *Aconite* wolf-bane. Monk's-hood. A genus of the first class polyandria, order trigyna. The common monk's hood, a rapanelus, is a native of the mountainous and woody parts of Germany, France, and Switzerland, but is cultivated in our flower-gardens for the beauty of its colour, which is sometimes white, sometimes yellow, and sometimes blue, and like many other plants, is beautifully distinguished in its petals by such horticulture. Every part of it is strongly poisonous. The extract, or inspissated juice, is given in acute rheumatism, scrophula, and scurvy. Its virtues are sudorific and diuretic, generally, however, accompanied with vertigo, or giddiness of the head. It may be begun as a full dose at gr 2, which should be gradually and cautiously augmented. The common character of the Latin genus *aconitum*, is calyx-

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less, five petalled, the uppermost marked, obovate, peduncled, recurved, subequal three or five. There are fifteen known species.

**ACONTIAS**, a name used by some authors, for a sort of comet, or meteor, whose head appears round or oblong, and its tail very long, and slender, resembling a javelin.

**ACONTIAS** (*ακοντισια*, a swift meteor, from *ακοντιζω*, *to dart*) The poisonous dart-snake, so called from its agility. Its flesh was formerly used as a restorative in medicine.

**ACONTIUS**, a youth of Cera, who, when he went to Delos to see the sacrifices of Diana, fell in love with Cydippe, a beautiful virgin, and being unable to obtain her, wrote verses on an apple, which he threw into her bosom. Cydippe read these verses and being compelled by the oath she had inadvertently made, married Acontius. (*Ovid*).

**ACOR** (from *aceo*, to be sharp) Acidity in the stomach.

**ACORIA** (*ακορια*, from *a neg* and *κορω*, *to satisfy*) Bulimia, *ιδδελιγλια*. Ravenous, or common appetite.

**ACORUS**. The fruit, or nut of trees of the oak kind.

**ACORN**, a little ornamental piece of wood, in the shape of a cone, fixed on the top of the spindle on the mast-head, above the vine, to keep it from coming off the spindle in a whirlwind.

**ACORN-SHIELD**. In scolocology. See **LEPAS**.

**ACORUS** (*ακος* or from *a neg* and *κορω*, *to procure*) The scabgrain, or flour de lis. In medicine, formerly used as an astringent and hence its name.

**ACORUS CALAMUS**. The systematic name for **CALANUS AROMATICUS**, which see.

**ACORUS PALLASII**. See **GLADIOLUS LUTAS**.

**ACORUS VEPUS**. The same as **ACORUS CALAMUS**.

**ACORUS VULGARIS**. The same as **ACORUS PALLASII**.

**ACORUS**. Sweet-rush. A genus of the first class, and order hexandria monogynia, thus generically characterized: spadix cylindrical, covered with flowers, corol six-petalled, naked, styleless, capsule three celled. Two species of this plant have been detected, the *acalmus*, vulgarly called sweet-flag, found in the pools of our own and other countries of the same latitude, the roots of which form the *calamus aromaticus* of the shops. And the *agrammeus*, a native of China, and which has been cultivated in the royal garden at Kew. See **CALANUS AROMATICUS**.

**ACORYPHOLUS** (*ακορυφος*, from *a neg* and *κορυφη*, *a head*) In botany, applied to vegetables, which like the tendrils of a vine, terminate in a point, without head or flower.

**ACOSMIA** (from *a neg* and *κοσμος*, *beauty*) Ill health, as productive of loss of beauty.

**ACOSMOUS** (from *acosmia*) Pale, thin;

bald; because the bald are supposed to have lost their greatest ornament

**ACOTYLEDON** (*ακοτυληδων*, from *α* neg and *τυληδων*, a *cotyledon*) In botany, applied to seeds that are without cotyledons

**ACOTYLEDONOUS PLANTS** (*Plantae acotyledones*) Without cotyledons or lobes to the seed, and consequently not having any seminal leaves, as in the class cryptogamia. The distinction of vegetables into cotyledons, monocotyledons, dicotyledons, and polycotyledons, or into such as have no lobes, one lobe, two lobes, or several in a seed, has been long made, and is the basis of Jussieu's natural arrangement. It is doubtful, however, whether any plant be strictly acotyledonous: those most suspected so, having been of late found possessed of one or more cotyledons upon more minute examination.

**ACOUSMATICI**, sometimes also called Acousticæ, in Grecian antiquity, such of the disciples of Pythagoras as had not completed their five years probation.

**ACOUSTIC**, in general, denotes any thing that relates to the ear, or the doctrine of sounds.

**ACOUSTIC VESSELS**, in the ancient theories, were a kind of vessels, made of brass, shaped in the bell-fashion, which being of all tones within the pitch of the voice, or even of instruments, rendered the sounds more audible, so that the actors could be heard though all parts of the theatres, which were even 400 feet in diameter.

**ACOUSTICS**, the doctrine, or theory of hearing, or of sounds. The word is derived from the Greek *ακουω*, *audio*, to hear. The ancients seem to have considered sounds under no other point of view than that of music, that is to say, as affecting the ear in an agreeable manner. It is even very doubtful whether they were acquainted with any thing more than melody, and whether they had any art similar to that which we call composition. The moderns, by studying the philosophy of sounds, so much neglected by the ancients, have given birth to a new science distinguished by the name of acoustics, which has for its object the nature of sounds, and treats also of the theory of hearing, and the best means of assisting that sense. This science is divided by some writers into diacoustics, which explains the properties of those sounds that come directly from the sonorous body to the ear, and catacoustics which treats of reflected sounds: but such distinction does not appear to be of any real utility. Sturmius in his Elements of Universal Mechanics, treats of acoustics. After examining into the nature of sounds, he describes the several parts of the external and internal ear, and their several uses and connexions with each other, and from thence deduces the mechanism of hearing: and lastly, he treats of the means of adding an intensity of force to the voice and other sounds, and explains the nature of echoes, otacoustic tubes, and special ing trum-

pets. On many particulars connected with this science, opinions are still much divided, and there have not been made experiments sufficient to determine what is essential to the nature of a vehicle of sound, how it is transmitted, reflected, or destroyed, in many instances or whether its velocity be uniform or variable.

Thus, with respect to the vehicles of sound, as sounds have not been heard when the vibrating body has been struck in vacuo, it is manifest that air is a vehicle: yet we must not assert that it is the only vehicle, for water, metals, and almost all substances of any density or texture, will not only transmit sound, but even convey it more readily and perfectly than air, which is by no means a good vehicle. Fishes have a strong perception of sounds, even at the bottom of deep rivers. From hence, it would seem not to be very material in the propagation of sounds, whether the fluid which conveys them be elastic or otherwise. One thing however is certain, that whether the medium be elastic or not, whatever sound we hear is produced by a stroke, which the sounding body makes against the fluid, whether air or water. The fluid being struck upon, carries the impression forward to the ear, and there produces its sensation. But the manner in which this conveyance is made, is still disputed: whether the sound be diffused into the air, in circles beyond circle, like the waves of water when we disturb the smoothness of its surface by dropping in a stone, or whether it travels along, like rays diffused from a centre, somewhat in the swift manner that electricity runs along a rod of iron. These questions which have greatly divided the learned, it must be observed, though, that some late experiments have tended much to remove the difficulties here alluded to, as will be seen under the proper articles in this work. See **CHORD**, **ECHO**, **ELASTIC STRING**, **EAR**, **SOUND**, **TRANSMISSION**, **VELOCITY**, **VIBRATION**, &c.

**ACOUSTICS**, is a name sometimes given to instruments or medicines which assist the hearing.

**TO ACQUAINT** *v* *a* (*accounter*, Fr) 1 To make familiar with (*Darius*) 2 To inform (*Shakespeare*)

**ACQUAINTANCE** *s* (*acquaintance* Fr) 1 The state of being acquainted with, familiarity, knowledge (*Digden Attorney*) 2 Familiar knowledge (*South*) 3 A slight or initial knowledge short of friendship (*Swift*) 4 The person with whom we are acquainted

**ACQUAINTED** *a* Familiar, well known (*Shakespeare*)

**ACQUEST**, or **ACQUIST**, is understood in a legal sense, of goods or effects, not descended or held by inheritance, but acquired either by purchase or donation.

**ACQUEST** is also popularly used for conquest, or a place acquired by the sword.

**TO ACQUIRE** *v* *n* (*acquirer*, Fr *acquiescere*, Lat) To rest in, or remain satisfied with (*South*)

## A C R

**ACQUIESCENCE** *s* (from *acquiesce*)  
 1. A silent appearance of content (*Clarendon*)  
 2. Satisfaction, rest, content (*Addison*)  
 Submission, confidence (*South*)

**ACQUIRABLE** *a* (from *acquire*) That may be acquired, attainable (*Bentley*)

To **ACQUIRE** *v a* (*acquiro*, Lat) 1

To gain by one's labour or power (*Shakspeare*)  
 2 To come in to attain (*Grave*)

**ACQUIRED** *particip* (from *acquire*) Gained by one's self (*Isaacs*)

**ACQUIRIMENT** *s* (from *acquire*) That which is acquired, gain, attainment (*Addison*)

**ACQUIRIR** *s* (from *acquire*) The person that acquires, a gainer

**ACQUISITION** *s* (*acq uis it io* Lat) 1 The act of acquiring or gaining (*South*)

The thing gained, acquirement (*Denham*)

**ACQUISITIVE** *a* (*acqui sitivus*, Lat) That is acquired or gained (*Hollan*)

**ACQUISIT** *s* (See *ACQUEST*) Acquirement, attainment not in use (*Milton*)

To **ACQUIT** *v a* (*acquitter* Fr) 1 To set free (*Spenser*) 2 To clear from a charge of guilt, to absolve (*Dryden*) 3 To clear from any obligation (*Dryden*)

**ACQUITMENT** *s* (from *acquit*) The state of being acquitted, or act of acquitting (*South*)

**ACQUITTAI**, a discharge, deliverance, or setting free of a person from the guilt or suspicion of an offence. Acquittal is of two kinds, in law, and in fact. When two are appealed or indicted of felony, one is principal, the other as accessory, the principal being discharged, the accessory is by consequence, also freed in which case, as the accessory is acquitted by law, so is the principal in fact.

**ACQUITTAUCE** a discharge in writing for a sum of money that the party has paid. No man is obliged to pay a sum of money, if, when he has provided a proper stamp, the demandant refuse to give an acquittance, which bars all actions.

**ACRA**, or **ACRE**, on the coast of Phoenicia in Turkey. Its ancient name was Ake, or Aecho, as it is called in Scripture. The Arabs call it Akka at this day. The time of Asars were, never able to drive the ancient inhabitants from this place. This town was taken by the Saracens in 636. In 104 the Christians became masters of it. In 1157, Saladin, sultan of Egypt, got possession of it and in 1191, Philip, king of France and Richard, king of England, retook it, but in 1291, the Saracens assaulted and destroyed the fortifications, when they afterwards repulsed. It was taken from them by the Turks in 1517. This place was besieged during the late war by the army under Bonaparte, but defended by Sir Sydney Smith, who here obtained signal honours by his bravery and magnanimity. Lat 32. 38 N Long 35. 20 E

**ACRA**, in the ancient geography, a town of Syria, whose inhabitants were called Acren-

## A C R

*es* It stood to the south of Syracuse, at the distance of twenty-four miles, near the place now called the monastery of Santa Maria d'Arcia, on an eminence, as appears from Silius Italicus. The Syracussans were the founders of it, according to Thucydides, seventy years after the building of Syracuse, or 666 before Christ. Hence the epithet Acreus.

**ACRA** (Josephus), one of the hills of Jerusalem, which stood the lower town, which was the Old Jerusalem, to which was afterwards added Zion or the city of David. Probably called Acre from the tower which Antioch built there, in order to annoy the temple and which Simon Maccabeus took and razed to the ground.

**ACRA**, **ACRAE** The period of menstruation. Also the nymphomania, or furor uterinus.

**ACRACY** (*ακρα* *ακρα* from *a neg* and *κρατος*, strength) Weakness, impotency, debility, from relaxation or a lost tone of the

**ACRASY** (*ακρα* *ακρα* from *a neg* and *κρατος*, to nerve) Intemperance, from the metaphor of wine unmixed, or untempered with water. It applies to excess in eating, drinking or venery.

**ACRE** is used in the dominions of the Mogul, in regard to his revenues, for the sum of 100,000 roupies, eight roupies being equal to about one pound sterling.

**ACRE**, a quantity of land, containing four square rods, or 100 square poles or perches. The word perhaps is formed from the Saxon acre or German icker field, of the I tiner. Silmasius derives it from *acra*, used for *acena*, a land measure among the ancients, containing 10 feet. The length of the pole varies in different countries, and is called customary measure, the difference running from 16½ feet (the statute length), to 28. The acre is also divided into 10 square chains, of 42 yards each, that is 4840 square yards. An acre in Scotland contains four square rods, one square rod is 40 square fathoms, one square fathm, 40 square ells, one square ell, nine square feet, and 73 square inches. One square foot, 144 square inches. The Scots acre is also divided into 10 square chains but the length of the Scots chain is to that of the English chain, as 8028 to 7920. So that the Scots acre is to the English acre, as 100,000 to 78,604. The French acre, arpent contains 1½ English acre, or 55200 square English feet whereof the English acre contains only 43560. The Strasburg acre is about half an English acre. The Welsh acre contains commonly two English ones. The Irish acre is equal to one acre, two rods, nineteen perches. Sir William Petty, in his Political Arithmetic, reckons that England contains 39 millions of acres but Dr Grew, in Phil Trans No 330, computes that England contains not less than 46 millions of acres, whence he infers that it is above 46 times as large as the pre-

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vince of Holland Mr Pitts Capper, in his Statistical Account of England and Wales, states the cultivated land at about 28 millions of acres, the uncultivated amounting to 9 millions, and the whole at 37,260,855 acres. This result corresponds nearly with Sir William Petty's.

**ACRĒ** (ἀκρῆ, from ἀκρῆς, *extreme*) The tip of the nose, the extremity of any other organ.

**ACRĒA** (the plural of *Acres*) Extremities, as the nose, ears, legs, &c.

**ACRLDULA** (ἀκρὸν αὐτῶν) The night-mare.

**ACRISTIA**, a term purely Greek, ἀκρίστια, literally denoting an exquisite or delicate delicacy, it is sometimes used in our language for want of a word of equal significance.

**ACRID** (ακρίδιν, from *acer*, sharp) Of pungent taste, or penetrative heat, acrimonious.

**ACRIDOPITAGI**, an Ethiopian people and so have led on locusts, the name imports.

**ACRIFORM** (from *acris*, sharp and *folium*, a leaf) A plant with prickly leaves.

**ACRIMONIOUS** a. Abounding with acrimony, sharp, corrosive (*Harvard*).

**ACRIMONY** s. (*acrimonia*, 1st) 1 Sharpness, corrosive (*Bacon*) 2 Sharpness of temper, severity (*South*).

**ACRIMONY** (ακρίμονια, from *acris*, sharp) In medicine, an erosive, irritative, or pungent power in medicinal substances, or the humours of the body in a state of privacy or disease.

**ACRIS** (from ἀκρῆ, the top of a mountain) The sharp extremity of a fractured bone. Also a locust.

**ACRISIUS**, king of Argos, and brother of Prætor, whom, after many dissensions he drove from Argos. Acrisius had Danice by Euryclea daughter of Iphiclus, and being told by an oracle, that his daughter's son would put him to death, he confined Danice in a brazen tower, to prevent her becoming a mother. She however became pregnant by Jupiter, changed into a golden shower, and though Acrisius ordered her, and her infant called Perseus, to be exposed on the sea, yet they were saved, and Perseus soon after became so famous for his actions, that Acrisius, anxious to see so renowned a grand son, went to Lacedæmon. Here Perseus, wishing to shew his skill in throwing a quoit, killed an old man who proved to be his grandfather, whom he knew not. In this, therefore, the oracle was fulfilled. Acrisius reigned about thirty-one years.

**ACRISY** (ακρίσις ἀκρίσις, from *acris* and *crisis*, to judge) The state of a disease, in which the symptoms are indecisive of the event.

**ACRITOUS** (ακρίτος, from the same as *Acrisy*) Uncertain, indecisive as to the event of a disease.

**ACRIVIOIA** (from *acris*, pungent, and *violæ*, the violet) The nasturtium Indicum, or Indian cress, so named from its pungency.

## ACR

**ACROAMATIC**, in an especial sense, denotes a thing sublime, profound, or abstruse. In which sense, it stands opposed to exoteric. We say acroamatic philosophy, acroamatic theology, an acroamatic method, acroamatic interpretation, &c.

**ACROAMATIC** is sometimes also used in a more general sense for any thing kept secret, or remote from popular use.

**ACROASIS** (ἀκροασίς, from ἀκροάομαι, to hear) The sense of hearing.

**ACROASTICS**, a name given to Aristotle's lectures in the more difficult and nice parts of philosophy, to which none but his disciples and intimate friends were admitted, whereas the exoteric were public or open to all, but there are other differences. The acroastics were set apart for the higher and more abstruse subjects, the exoteric were employed in rhetorical and civil speculation. A aim, the acroastics were more subtle and exact, evidence and demonstration being here aimed at, the exoteric chiefly aimed at the probable and plausible. The former were the subject of the morning's exercises in the Lyceum, the latter of the evening. And but the exoteric were published, whereas the acroastics were kept secret.

**ACROBATIC** or **ACROBATICUM**, from ἀκρῆ, high and βᾶσις, or βῆσις, I go, an circuitous way, whereby people were used aloft, that they might see more conveniently about them.

**ACROBYSTIA** (ἀκροβυστία, from ἀκρῆ, the extremity and βύσις, to cover) The extremity of the prepuce, the prepuce itself.

**ACROCHEIR** (ἀκροχειρ, from ἀκρῆ, extreme and χεῖρ, the hand) The wrist.

**ACROCHIRISMUS** among the Greeks, a sort of gymnastic exercise, in which the two combatants contended with their hands and fingers only.

**ACROCHORDON** (ἀκροχόρδον, from ἀκρῆ, the extremity, and χορδή, a string) A wart with a small pedicle, so that it seems to hang by a stem.

**ACROCOPIA** (from ἀκροῦ and κοπή) The extremities of mounds, giblets, or petuetos.

**ACROCORDUS** In myriophyllus, a genus of serpents, characterized by having its body covered with warty tubercles. Of this genus there is only known one species, the Javaicus or warty snake of Java, defined as follows: brown beneath paler, the sides obscurely variegated with a whitish hue, head somewhat flattened, hardly wider than the neck, body gradually thicker towards the middle, and suddenly contracting near the tail, which is short and slightly acuminate. See Natrix pinnata. It inhabits Java, chiefly among the pepper plantations, grows sometimes to seven feet long. The warts, or prominences by means of a magnifying glass, appear to be convex, carinate scales, and the



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smaller ones are furnished with two minuter prominences, one on each side of it

**ACRODRYA** (from *ακρον*, and *δρυς*, *an oak*) An acorn and hence any fruit having a hard rind or shell

**ACROLENION**, or **ACROLENIUM** (*ακροληνιον*, from *ακρον*, the *extremity*, and *αληνη*, the *cubit*) The *olecranon*, or upper extremity of the ulna

**ACROMANIA** (*ακρομανια*, from *ακρο*, *extreme*, and *μανια*, *madness*) Incurable madness

**ACROMION** (*ακρωμιον*, from *ακρον*, and *ωμος*, the *shoulder*) The humeral process or extremity of the scapula

**ACROMONOGRAMMATICUM**, a kind of poem wherein every subsequent verse begins with the letter wherewith the immediately preceding one terminates

**ACROMPHALION**, or **ACROMPHALIUM** (*ακρομφαλιον*, from *ακρο*, and *αμφαλο*, the *navel*) A prominent or projecting navel

**ACRONYCHAL**, or **ACRONYCAL**, in astronomy, is applied to a (1) in or planet, when it is opposite to the sun. It is from the Greek *ακρονυχος*, the point or extremity of night because the sun rose then set, or the beginning of night, and set it sun rise, or the end of night, and so it time all the night. The acronychal is one of the three Greek poetic risings and settings of the sun, and tunds distinguished from comical and heliacal. By means of which, for want of accurate instruments, and other observations, they might regulate the length of their year

**ACRONYCTIC**, stars rising in the evening twilight

**ACROPOIITA** (Georgic), a writer on the Byzantine history, was born at Constantinople, in 1220. He had a dispute at the age of twenty-one with a physician, concerning the eclipse of the sun, before the emperor John, who made him great physician, or chancellor of the empire. He was also sent on various embassies, and filled several important stations. He died in 1282. His Chronicle of the Greek empire begins in 1203, and ends in 1261. It was printed at Paris in Greek and Latin in 1651, fol

**ACROSPERMUM** A genus of the Linnean class and order cryptogym fungi, characterised as follows fungus quite simple, globular, sessile, spongy seed crowded, supplying the place of a bark. There are four known species

**ACROPOSTHIA** (*ακροποστιθια* from *ακρο* and *ποστη*, the *prepuce*) The termination of the prepuce imputed in circumcision

**ACROSS** *ad* Athwart, laid over something so as to cross it (*Bacon*)

**ACROSTICK** *s* (from *ακρο*, and *στη*, *Gs*) A poem in which the first letter of every line being taken makes up the name of the person or thing on which the poem is written. Among ecclesiastical writers, acrostics denote

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the ends of verses of psalms, which the people sang by way of chorus, or response, to the precentor, or leader of the psalm. This was called singing acrostics, acrostichia, which was a species of psalmody usual in the ancient church. Acrostic in this sense, amounts to the same with hypopsalma, drupsalma, acrotelution, and ephymnion, which are all terms of the same signification. Though an acrostic properly signifies the beginning of a verse, yet it is sometimes also used for the end or close of it, as by the author of the Constitutions, when he orders one to sing the hymns of David, and the people to sing after him the acrostics or ends of the verses

**ACROSICHUM** Wall rue Forked fern A genus of the Linnean class and order cryptogym filices, its fructification covering the whole surface of the frond, or fern-foilage, and with it involucre. There are about thirty species, which may be arranged under those with an undivided frond, with a frond divided, a pinnate frond, and a frond double-pinnate

**ACROSTOLIUM**, in antiquity, an ornament of the prow or forecastle of a ship, chiefly of war, sometimes shaped like a buckler, a helmet, or an animal, but more frequently turned circular or pial

**ACROTERIA** (*ακροτερια*, from *ακρο*, *extreme*) The extreme parts, as the hands, feet, ears, nose, &c

**ACROTHERIA**, in architecture small pedestals, usually without base, anciently placed at the middle or two extremes of pediments or frontispieces, serving to support the statues, &c. It also signifies the figures placed as ornaments on the tops of churches, and the sharp pinnacles that stand in ranges about flat buildings with rails and ballusters

**ACRYDIUM** In Fabricius, a tribe or family of the genus gryllus, or cricket, consisting of few individuals. See **GRYLUS**

To **ACT** *v n* (*ago*, *actum*, Lat) 1 To be in action, not to rest (*Pope*) 2 To perform the proper functions (*South*) 3 To practise arts or duties to conduct one's self (*Dryden*) 4 To produce effects in some passive subject (*Arluhot*)

To **ACT** *v a* 1 To bear a borrowed character, as a stage-player (*Pope*) 2 To counterfeits, to feign by action (*Dryden*) 3 To actuate, to put in motion, to regulate the movements (*South*)

**ACT** *s* (*actum*, Lat) 1 Something done, a deed, an exploit (*Shakspeare*) 2 Agency, the power of producing an effect (*Shakspeare*) 3 Action, the performance of exploits (*Dryden*) 4 The doing of some particular thing, a step taken, a purpose executed (*Shakspeare*) 5 A state of reality, effect (*Hooker*) 6 A part of a play during which the action proceeds without interruption (*Roscommon*) 7 A decree of a court of justice

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lice (*Shakspeare*) 8 Record of judicial proceedings (*Dyktse*)

**ACT**, in the universities, signifies a thesis maintained in public by a candidate for a degree, or to show the capacity and proficiency of a student At Oxford, the time when masters or doctors complete their degrees is also called the act, which is held with great solemnity At Cambridge they call it the commencement

**ACT OF FAITH**, *Auto da fe*, in the Romish church, is a solemn day held by the inquisition, for the punishment of heretics, and the absolution of the innocent accused The *auto da fe* may be called the last act of the inquisitorial tragedy It is a kind of gaol delivery, appointed as oft as a competent number of prisoners in the inquisition are convicted of heresy, either by their own voluntary, or extorted confession, or on the evidence of certain witnesses The process is this in the morning they are brought into a great hall, where they have certain habits put on which they are to wear in the procession The procession is led up by Dominican friars, after which come the penitents, some with sin betwoons, and some without, according to the nature of their crimes, being all in black coats without sleeves, and bare footed, with a wax candle in their hands The act is followed by the penitents who have narrowly escaped being burnt, who over their black coats have flames painted with their points turned downwards, *fuogo rivolto* Next come the negative, and relapsed, who are to be burnt, having flames on their habits pointing upwards After these come such as profess doctrine contrary to the faith of Rome, who besides flames pointing upwards, have each their picture painted on their breasts, with dogs, serpents, and devils all open-mouthed, about it After sentence is passed by the civil magistrate, they are immediately carried to the Ribera, the place of execution, where there are as many stakes set up as there are prisoners to be burnt, with a quantity of dry furze about them The stakes of the professed, that is, such as persist in their heresy, are about four yards high, having a small board towards the top for the prisoner to be seated on The negative and relapsed being first strangled and burnt, the professed mount their stakes by a ladder, and the Jesuits, after several repeated exhortations to be reconciled to the church, part with them, telling them they leave them to the devil, who stands at their elbow to receive their souls and carry them into the flames of hell On this agonising shout is raised, and the cry is, Let the devils be made, which is done by thrusting flaming furzes fastened to long poles against their faces, till their faces are burnt to a coal, which is accompanied with the loudest acclamations of joy At last fire is set to the furze at the bottom of the stake, over which the professed are chained so high, that the top of the flame

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seldom reaches higher than the seat they sit on, so that they rather seem roasted than burnt There cannot be a more lamentable spectacle, the sufferers continually cry out, while they are able, *Misericordia per amor dei*, "Pity for the love of God" yet is this horrid scene beheld by all sexes and ages, with transports of joy and satisfaction

**ACT**, in dramatic poetry, signifies a certain division, or part, of a play, designed to give some respite both to the actors and spectators The Romans were the first who divided their theatrical pieces into acts, and in the time of Horace, all regular and finished pieces were divided into five

**ACT OF PARLIAMENT** is a positive law, consisting of two parts, the words of the act, and its true sense and meaning, which being joined, make the law The words of acts of parliament should be taken in a lawful sense Cases of the same nature are within the intention, though without the letter, of the act, and some acts extend by equity to things not mentioned therein **SEC PARLIAMENT**

**ACTA POPULI**, among the Romans, were journals or registers of the daily occurrences, as assemblies, trials, executions, buildings, births, marriages, deaths &c of illustrious persons, and the like These were otherwise called *acti publica* and *acti diurna*, or simply *acta* The *acta* differed from annals, in that only the greater and more important matters were recorded in the latter, whilst those of less note appeared in the former

**ACTULA** Blue-berry Herb Christopher Agnus in the Linnæan class and order polyandria monogynia, thus characterised calyx four leaved, petals four, berry one celled, many-seeded, seeds flat There are four species, two of which are natives of Japan and China one (a racemose) of North America, and one (a spicata) of the woods of our own country

**ACTÆON**, in fabulous history, the son of Arius and Autonoe, a great hunter He was turned by Diana into a stag, for looking on her while bathing, and died by his own dogs

**ACTÆ, ACTÆ or ATTHIS**, ancient names of Attica Pliney extends it to the isthmus of Corinth, so as to include Megaris Others make this last a distinct district because Megaris was always the rival and enemy of the Athenians If so, then Attica was bounded on the west by Megaris, on the north by Boeotia, separated from it by high mountains, through which there was a difficult passage, on the south by the Saronic bay, with the Egæan sea on the east It was called Actæ from its mountain situation, hence Actica and Attica and the epithets Actæus and Atticus (*Oru*) Hence also Actæus for Atheniensis (*Ingrit*)

**ACTIAN GAMES**, in Roman antiquity, solemn games instituted by Augustus, in memory of his victory over Mark Anthony at

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**Actum**, held every fifth year, and celebrated in honour of Apollo, since called Actus. Hence Actian years commenced at the battle of Actium, called the ear of Augustus.

**ACTINIA** In zoology, the thirty fifth genus of order n or mollusca, in the Linnean class worms. It is thus characterised body oblong induried, fleshy, contractile, fixed by the base, mouth terminal, expansile surrounded with numerous cirt, and without any other aperture. It is a marine, viviparous animal, with no aperture belonging to its body but the mouth, it feeds on shell fishes and other inhabitants of the sea, which it draws in through its tentacula, or feelers, in a short time rejecting through the same aperture, the shells and indigestible parts it assumes various forms, and when the tentacles are all expanded, has the appearance of a full-blown flower. Many of the species are eatable, and some of them very said. Its known species are, 1 a unicorn, sea-memory, 2 a bellis, sea-daisy, 3 a dionthus, sea carnation, 4 a calendar, sea-marigold.

**ACTINIA** In botany, a genus of the Linnean class and order Syngenesia polyama superflua, thus characterised receptacle naked, seeds crowned with a many-leaved chuff, the chaff awned, calyx many-leaved, equal. Of this genus only a single species is known, which was first described by Jussieu.

**ACTINOLITE, GLASSY** In oryctology. See **ACTINOTUS**.

**ACTINOTUS, ACTINOTE** In Gemellus improved oryctologic system of Linneus which is that we shall chiefly adhere to in the present work, a genus of the class carthos, and order tucose as generically characterised. Consisting of carbonit of magnesia, a larger proportion of oxyd of iron, and the greatest part silic or silica (silicous earth) harsh to the touch, shining rigid, fragile pyrostatic generally of a green colour, spontaneously falling into granular fragments, but breaking into indeterminate fragments melting in the fire, with ebullition, into a pellucid six-coloured globule. There are three species. 1 A fibrosus, found with pyrites in the mines of Saxony. 2 A vulgaris, found in the iron mines of Sweden the asbestos of Kirwan radiated schori of Schmeissner. 3 A vitreus, Isle of Sky, Altemont in Dauphine and in the Tyrolese mountain. Glassy actinolite of Kirwan, vitreous striated schori of Schmeissner. Malacolite of Thomson.

**ACTION**, in a general sense, denotes the operation of a power. The idea of action is so familiar to us, that a definition may as easily obscure as explain it. Some schoolmen, however, attempt to express its nature by a manifestation of the power or energy of a substance; made either within, or without it. Thus, say they, when the mind acts, what does it more, than perceive a vital power exerting itself, as, in reality, the several actions

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of the mind are no other than so many indications of its vitality? Grammarians observe some distinction between action and act, the former being generally restricted to the common or ordinary transactions, whereas the latter is used to express those which are remarkable. Thus, we say it is a good action to comfort the unhappy, it is a generous act to deprive ourselves of what is necessary for their sake. The abbé Girard makes a further distinction between the words action and act.

The former, according to him, has more relation to the power that acts than the latter, where is the latter has more relation to the effect produced than the former and hence the one is properly the attribute of the other. Thus we may properly say, "Be sure to preserve a presence of mind in all your actions, and take care that they are all acts of equity."

Dr Reid is of opinion that no being can be an agent, or perform an action, in the proper sense of the word which does not possess, in some degree the powers of will and understanding. If this opinion be just it is obvious, that what are called the powers of nature such as impulse, attraction, repulsion, electricity, &c are not strictly speaking powers or causes but the effects of the agency of some active and intelligent being, and that physical causes to make use of common language are nothing more than laws or rules, according to which the agent produces the effect. This doctrine has been very actively controverted, we are however, inclined to adopt it, and might proceed to a positive defence of it, were it not likely to lead us too great a length. We shall here consider an important question, the answer to which will, we think, go far towards removing all objections to Dr Reid's opinion. Can an agent operate where, either by itself or by an instrument, it is not present? We think not, because agency, or the exertion of power, must be the agency of something. The constitution of the human mind compels us to attribute every action to some being, but if a being could act in one place from which it is absent, it might do the same in a second, in a third, and in all places, and thus we should have action without an agent for to be absent from all places is a phrase of the same import as not to exist. But if a living and intelligent being cannot act but where it is either immediately or instrumentally present, much less surely can we attribute events of any kind to the agency of an absent and unanimated body. Yet it has been said, that "we have every reason which the nature of the subject and of our own faculties can admit of, to believe, that there are among things inanimate such relations, that they may be mutually causes or principles of change to one another, without any exertion of power, or any operation of an agent, strictly so called. Such relation is, for aught that we know, may take place among bodies at great distances from

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one another, as well as among bodies really or seemingly in actual contact, and they may vary both in degree and in kind, according to the distances between the bodies. That any thing should be a cause or principle of change to another, without the exertion of power or the operation of an agent, appears to us a palpable contradiction, and we could as easily conceive any two sides of a triangle to be not greater than the third side, as reconcile such a proposition to that faculty of our minds by which we distinguish truth from falsehood. When we see one body the apparent cause of change in another body, we cannot possibly entertain a doubt of the exertion of power, but whether that power be in the body apparently producing the change, or in a distinct agent, is a question to which in answer will not so readily be found. That it is in a distinct agent, we are strongly inclined to believe, not only by the received doctrine concerning the inertia of matter, which, though it has been frequently controverted, we have never seen disproved, but much more by considering the import of an observation frequently introduced to prove the direct contrary of our belief. 'We cannot be charged (says the writer whom we have just quoted) with maintaining the absurdity, that there may be an effect without a cause, when we refer the fall of a stone to the ground, and the ebbing and flowing of the sea, to the influence of the earth on the stone, and of the sun and moon on the ocean according to the principle of general gravitation. We admit the truth of this observation, provided the influence of the sun and moon on the ocean be possible, but, to admit that, it appears impossible, and is certainly inconceivable. The influence of the sun and moon can here mean nothing but the action or operation of the sun and moon; but if these two bodies be inanimate, they cannot act at all, in the proper sense of the word; and whatever they be, it is obvious that they cannot act immediately on an object at such a distance from them as the earth and the ocean. If they be the agents, they must operate by an instrument, as we do when moving objects, to which our hands cannot reach; but as it may be shown that neither air, nor ether, nor any other material instrument which has yet been thought of, is sufficient to account for the phenomena of attraction and repulsion, it is surely much more rational to conclude, that the ebbing and flowing of the sea are produced, not by the influence of the sun and moon, but by the power of some distinct agent or agents. What those agents are, we pretend not to say. If the Supreme Being himself be the immediate author of every change which takes place in the corporeal world, it is obvious that he acts by fixed rules, of which many are apparent to the most heedless observer, whilst the discovery of others is reserved for the reward of the judicious application of the faculties which he has given us. If he employ inferior agents to carry on the great operations of nature, it

is surely not difficult to conceive that the powers of those agents which were derived from him, may by him be restrained within certain limits, and their exercise regulated by determined laws, in such a manner as to make them produce the greatest benefit to the whole creation. Nor let it be thought an objection to this theory, that the changes which take place among bodies at great distances from each other, vary both in degree and in kind according to the distances, for this variation, which we acknowledge to be a fact, appears to us wholly unaccountable upon any other hypothesis than that which attributes the different changes to agents distinct from the bodies themselves. Did we perceive all the particles of matter, at all distances, tending towards each other by a fixed law, we might be led to consider mutual attraction as an essential property of that substance, and think no more of inquiring into its cause, than we think of inquiring into the cause of extension. But when we find that the same particles, which at one distance seem to attract each other, are at a different distance kept under by a power of repulsion, which no force, with which we are acquainted, is able to overcome, we cannot attribute the principle or cause of these changes to brute matter, but must refer it to some other cause, exerting power according to a fixed law. *Sup. Encyc. Brit.* On the whole, we conclude, the candid enquirer after truth will after careful reflection, see abundant reason to reject that philosophy which would exclude the agency of mind from the universe, and be induced to refer real agency to mind alone. Yet as we are aware that our grand object in this work should be to give a concise and accurate account of sciences as they are, and of principles as they are most generally adopted, we hope we shall be excused if we are not so frequently combating the erroneous notions of merely mechanical philosophers, as our inclination were we to consult that alone, might lead us to attempt.

**ACTION**, in ethics, or moral action, is a voluntary motion of a creature capable of distinguishing good and evil, whose effect, therefore, may be justly imputed to the agent. A moral action may be more fully defined to be whatever a man, considered as endowed with the powers of understanding and willing, with respect to the end he ought to aim at, and the rule he is to regard in acting, resolves, thinks, does, or even omits to do, in such a manner as to become accountable for what is thus done or omitted, and the consequences thereof. In the strict philosophical sense, says Dr Reid (*Essays on the Active Powers of Man*, p. 97) nothing can be called the action of a man, but what he previously conceived, and willed or determined to do. In morals the word is commonly employed in this sense, nor is any thing imputed to a man as his doing in which his will was not interposed. The foundation, then, of the morality of actions is that they are done knowingly and voluntarily, and all moral actions may be

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divided, with respect to the rule, into good and evil.

**ACTION**, in mechanics or physics, a term used to denote, sometimes, the effort which some body or power exerts against another body or power, and sometimes it denotes the effects resulting from such effort. It is one of the laws of nature, that action and re-action are always equal, and in contrary directions. Indeed it is not only a law of nature, but, if we may so speak, a law of human thought: the contrary would imply a contradiction. We cannot conceive action between the parts of matter without an equal re-action; for, if the action were greater than the re-action, the excess of that action would be against nothing, that is, it would not be action, which is a contradiction. And, if the re-action were greater, the excess would be without a cause, which once admitted, nothing can be denied. If a body be urged at the same time by equal and contrary actions, it will remain at rest. But if one of these actions be greater than its opposite, motion will ensue towards the part least urged. The actions of bodies upon each other, in a space that is carried uniformly forward, are the same as if the space were at rest, and any powers or forces that act upon all bodies, so as to produce equal velocities in them in the same, or in parallel right lines, have no effect on their mutual actions, or relative motions. Thus the motion of bodies on board of a ship that is carried uniformly forward, are performed in the same manner as if the ship was at rest. And the motion of the earth about its axis has no effect on the actions of bodies and agents that it suffers except in so far as it is not uniform and rectilinear. In general, the actions of bodies upon each other, depend not on them absolutely, but relative motion.

*Quantity of Action*, in mechanics, is more given by M. de Maupertius, in the Memoirs of the Academy of Sciences of Paris for 1744, and in those of Berlin for 1746, to the continual product of the mass of a body, by the space which it runs through, and by its celerity. He lays it down as a general law, that in the changes made in the state of a body, the quantity of action necessary to produce such change is the least possible. This principle he applies to the investigation of the laws of refraction, and even the laws of rest, as he calls them, that is, of the equilibrium or equipollency of pressures, and even to the modes of acting of the Supreme Being. In this way Maupertius attempts to connect the metaphysics of final causes with the fundamental truths of mechanics, to shew the dependence of the collision of both elastic and hard bodies, upon one and the same law, which before had always been referred to separate laws, and to reduce the laws of motion, and those of equilibrium, to one and the same principle. This ingenious geometer, finding the symbol  $MVS$  (or the quantity of matter, multiplied by the velocity and by the distance run over during the action) always

present itself to him as a mathematical minimum in the actions of bodies on each other, he was amused by the observation, and presumed that there was some reason for it in the nature of things. Finding that it gave him very neat solutions of many elementary problems in dynamics, he thought of trying whether it would assist him in accounting for the constant ratio of the sines of incidence and refraction, he found that it gave an immediate and very neat solution. This problem had, before his time, occupied the minds of Des Cartes and Fermat. Each of these gentlemen solved the problem by saying, that the light did not take the shortest way from a point in the air to a point under water, but the easiest way in conformity with the acknowledged economy of nature and consummate wisdom of its adorable Author. But how was this the easiest way, the course that economised the labour of nature? One of these gentlemen proved it to be so, if light move faster in air than in water, the other proved it to be so, if light move faster in water than in air. Both could not be right. Maupertius was convinced that he had discovered what it was that nature was so chary of, and grudging to waste—it was  $MVS$ . Therefore  $MVS$  can mean nothing but labour, nothing but mutual exertion, mechanical action, therefore  $MVS$  is the proper measure of action. He kept this great discovery a profound secret, and, being president of the Royal Academy of Berlin, he proposed for the annual prize question “Are the laws of motion necessary or contingent truths?” He could not come to a conclusion by the laws of the academy, but before the time of decision, he published it. Ponce his dissertation on the principle of the least action, in which he pointed out the singular fact of  $MVS$  being always a minimum, and therefore, in fact, the object of nature’s economical care. He solved a number of problems by making the minimum state of  $\frac{fvs}{m}$  a condition of the problem, and to crown the whole, shewed that the laws of motion which obtain in the universe could not be but what they are, because this economy was worthy of infinite wisdom, and therefore any other laws were impossible. The reputation of Maupertius was already established as a good mathematician and a worthy and amiable man, and he was a favourite of Frederick. The principle of least action became a mode, and it drew attention for some time, till it went out of fashion. It is no mechanical principle, but a necessary mathematical truth, as any person must see who recollects that  $v$  is the same with  $s$ , and that  $f$  is the same with  $mv$ . See **FORCE**, **MOTION**, &c.

**ACTION OF THE MOUTH**. In the manege, signifies the agitation of the tongue and mandible of a horse, or his champing upon the bit of his bridle, to keep his mouth fresh, whereby he emits a white rosy foam, which is in general looked on as a sign of health and vigour.

# ACTION

**ACTION**, in the manage implies the full and unportioned use of the muscles of a horse, directed to the point he is in view, whether of draught carriage, or mere speed in which no power is idly expended, nor suffered to lie dormant. This is often in a considerable degree the gift of nature, but far more frequently the result of a long series of training. Every one perceives that the cause of progression is by no means the same in all animals. How different, for example, is the gallop of a large dray-horse, from that of a good race-horse! It is with difficulty that the former moves his body to determine it into the pace required. He gathers the ground heavily under him at every step, and the advance of his hull is hardly effected. The latter on the contrary, flies as an arrow from a bow, and scarcely imprints the ground with his shoe, running often over a space of four miles in less than eight minutes. Yet these are but individuals of one and the same genus. The number of the parts which conspire to effect their respective progression is the same in each, but these parts differ naturally in their bulk and extent, and differently in their direction, whence result different degrees of power in the levers which they form. In the speed or progression of the horse, the hoof is uniformly admitted to be the part whose function is of chief consequence. A good judge will always prefer that which is wide and flat, to that which is narrow to denote strength, and this criterion of excellence is really confirmed by dissection.

**ACTION**, in the military art, is an agreement between two armies, or different bodies of troops. It is also used to signify some memorable act performed by some officer or commander.

**ACTION**, in law, the right of demanding in a legal manner what is any man's due, or the process brought for recovering the same.

**ACTIONS** are either criminal or civil.

**Criminal actions** are to have judgment of death, as murder, robbery, &c. or only judgment for damage to the injured, fine to the king, and imprisonment. Under the head of criminal actions may also be ranked penal actions, when he for some penalty or punishment, on the party sued, whether it be corporal or pecuniary. Also actions upon the statute, brought on breach of any statute, or act of parliament, by which an action is given that did not lie before, as where a person commits perjury to the prejudice of another, the injured shall have an action upon the statute. And lastly popular action, so called because any person may bring them on behalf of himself and the crown, by information, &c. for the breach of some penal statute.

**Civil actions** are divided into real, personal, and mixt. Real action is that whereby a man claims a title, lands, tenements, &c. in fee, or for life, and this action is either possessory or ancestral, possessory, where the land are in a person's own possession or seisin, ancestral, when they were in the possession or seisin of his ancestors. Personal action, is that brought

by one man against another, upon any contract for money or goods, or on account of trespass, or other offence committed, and then by the debt, goods, chattels, &c. claimed. Mixt action, one lying as well for the thing demanded as upon the person who has it, and on which the thing is recovered with damages for the wrong sustained, such is an action of waste sued against a tenant for life, the place wasted being recoverable, with treble damages, for the wrong done. All actions seem to be temporary. A real action may be prescribed against in five years after a fine levied, or recovery suffered. Writs of foreclosure for any title to lands in being must be sued out within twenty years. Actions of debt, account, detinue, trover, and trespass are to be brought within six years of a suit and battery within four years, and of slander within two years after cause of action and not afterwards. However it ought to be observed that the right of action in these cases is saved to infants, feme covert, and persons in prison, or beyond sea, &c. so as they commence their suits within the time limited after their imperfections are removed. Actions may be brought against all persons whomsoever, but those who are attainted of high treason or felony, or outlawed, excommunicated persons, &c. cannot bring an action till pardoned, absolved, &c.

A feme covert must sue with her husband, and infants by their guardians. Action upon the case is a real action which lies for the redress of wrong and injury done without force, and which by law are not provided against. It is the present is the most frequent of all actions. It may be brought in trespass, where no custom or usage has been established, and the reason why it is called an action upon the case, is because the whole cause of case is set forth in the writ. It may be brought well where there is no other action, as where no other lies. Action upon the case is a real action, is brought where a person is injured in his reputation, and for wrong which affects the life, office, trade, &c. or tend to the loss of preferment in a church, or otherwise, or to the dishonour, or to the damage of a person. Action of a writ is when upon a plea of some matter by which is shown, that the plaintiff had no cause to sue the writ brought, though, perhaps he may have another writ for the same matter. It is hence called a plea to the action of the writ, in contradistinction from a plea to the action.

**ACTION**, in oratory is an accommodation of the person of the orator to the subject, or, a management of the countenance, voice, and gesture, suited to the matter spoken or delivered. Action makes one of the greatest branches or divisions of rhetoric. The ancients usually call it pronunciation. Action is a collateral or secondary method of expressing our ideas and is susceptible of a kind of eloquence as well as the primary. In the infancy of language, when words were few, or not easily connected, men would naturally

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rally recur to action for explaining and expressing their conceptions, and they would labour to make themselves understood, by varying their tones of voice, and accompanying their tones with the most significant gesticulations. At this day, when persons speak in a language which they possess imperfectly, they have recourse to all these supplemental methods, in order to render themselves more intelligible. Besides, in the gradual improvement and extension of language, a warm imagination would introduce into discourse a variety of tones, and a considerable degree of action. Thus Dr Warburton accounts for so much speaking by action, as we find among the Old Testament prophets. Among the northern American tribes certain motions and actions are adopted in order to explain their meaning, on all great occasions of intercourse with one another. The Chinese find it more easy to express different ideas by a variety of tones than to contrive words for all their ideas. The Greek and Roman languages also were pronounced with more numerous inflections of voice and more animated gestures than any to which we are accustomed. Accordingly we find, that action was treated of by all the ancient critics as the chief quality in every public speaker and the orators and players of Greece and Rome were distinguished by the vehemence of their action. This is, in all cases an address to the external senses, which it endeavours to move and bring into its party by well-concerted motion and modulation, at the same time that the reason and understanding are attacked by force of argument. Accordingly, Tully very pertinently calls it *sermo corporis*, the discourse of the body, and *corporis eloquentia*, the eloquence of the body. The Roman mimes and pantomimes we read, had such a compass even of mute action, that voice and language seemed useless to them; they could make themselves understood to people of all nations, and Roscius, the comedian, is particularly famed, as being able to express any sentence by his gestures, as significantly and variously as Cicero with all his oratory. Quintilian gives us a system of the rules of action, taken not only from the writings of the ancient orators, but from the best examples of the form. What we usually attribute to eloquence, was really the effect of the action only, as some of the greatest masters in that way have frankly acknowledged. Demosthenes expressly calls it, "the beginning the middle, and the end of the orator's office," and Cicero professes, "that it is not of so much importance what the orator says, as how he says it." The Greeks, who were attentive to multiply the means of influencing the passions, omitted nothing which might bring to perfection this first language of nature. Poetry and music were always supported by the action of the performers. This action was acquired by a kind of dance that regulated the motions and different inflexions of the body, animated the discourses of their orators, and sometimes the lessons of their philosophers.

See Plut. in Demosth. tom. i. p. 851. ed. Kyhind. Id. in X. Rhct. Vit. tom. ii. p. 845. Plut. de leg. l. vii. tom. ii. p. 816. ed. Serrius. Athen. Deipn. l. i. c. 17. p. 21. ed. Casaub. Austin on Action, &c. The modern civilised nations are much more cautious and moderate in the use of action than the ancients were; indeed they are approaching so rapidly to the opposite extreme, that it is now under a question by many, whether action ought to be practised and encouraged at all? For our own parts, however, we doubt not, that moderate, judicious action, may be highly useful, if accompanied with suitable arguments and address. There is no nation, nor hardly any persons, so phlegmatic, and destitute of feeling, as not to accompany their words with some actions and gesticulations, whenever they are much in earnest. It would, therefore, be unnatural in a public speaker, and inconsistent with that earnestness and ardour which he ought to manifest in affairs of moment, to remain motionless like a statue, and let the words drop frigidly from his mouth, without any extraneous assistance from graceful gesticulation. Action, properly conducted, gives to the speaker, whether in the senate, at the bar, or in the pulpit, very great advantages in enforcing his arguments, and impressing an audience. We conclude, therefore, with the advice which Shakspeare puts into the mouth of Hamlet: "Sunt the action to the word, and the word to the action, with this special observance, that you overstep not the modesty of nature."

**ACTION** in a theatrical sense, is nearly the same with that amongst orators, with this difference, that the actor adapts his action to an assumed character, whereas the orator is supposed, in reality to feel the passion which his action expresses, whether joy, or grief, &c. See DECLAMATION.

**ACTION**, in poetry, is an event either real or imaginary, which makes the subject of an epic or dramatic poem. Thus, says Aristotle (*De Poet. cap. vi. p. 657*) is the soul of tragedy. The action of a poem coincides nearly with the fable thereof, it being the usual practice not to take any real transaction of history, but to feign or invent one, or at least to alter the historical fact, so as to render it in a good measure fictitious. Critics consider the principal action, commonly called the fable, and the incidental action, or episode. F. Bossu has two chapters of real actions, the recitals whereof are fables, and of feigned actions, the recitals whereof are historical. The critics lay down four qualifications as necessary to the epic and tragic action: the first, unity, the second, integrity, the third, importance, and the fourth, duration, to which some add a fifth, viz. continuity. Dr Blair specifies three properties, which are essential to the action or subject of an epic poem. It must be one, great, and interesting. Aristotle insists upon unity, as essential to epic poetry, and he observes, that, in order to render this unity more sensible to the imagination, and

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thus to give it a better effect it is not sufficient for the poet to confine himself to the actions of one man, or to those which happened during a certain period of time, but the unity must lie in the subject itself, and arise from all the parts combining into one whole. This unity of action is sufficiently apparent in all the great epic poems. Thus, Virgil has chosen for his subject the establishment of Æneas in Italy, which he keeps constantly in view, and which serves to connect all the parts. The unity of the *Odyssey* is of the same nature, the return and re-establishment of Ulysses in his own country. The subject of Tasso is the recovery of Jerusalem from the Infidels, that of Milton, the expulsion of our first parents from paradise, and both of them are unexceptionable in the unity of the story. The unity of Achilles, with its consequences, is the professed subject of the *Iliad*, but, as Achilles is in many books of the poem kept out of sight, and the fancy terminates on no other object than the success of the two armies that are seen contending in war, the unity is not so sensible to the imagination as in the *Æneid*. This unity of the epic action does not exclude all episodes, or subordinate action. Moreover, the unity of the epic action necessarily supposes that the action be entire and complete, or, as Aristotle expresses it, that it should have a beginning, middle, and end. If the three parts of a whole seem to be generally denoted by the words, beginning, middle, and end, Boissier interprets them more expressly thus: the causes and designs of a man's doing an action are the beginning, the effects of those causes, and the difficulties occurring in the execution of those designs, are the middle of it, and the unravelling and extricating of those difficulties, are the end of the action.

**ACTIONABLE** *a* (from *action*) That admits an action in law, punishable (*Hotel*)

**ACTIONARY**, or **ACTIONIST** *a* proprietor of stock in a trading company, a share in such a company being formerly called an action

**ACTION-TAKING** *a* Litigious (*Shakespeare*)

**ACTIFICATION** *s* (from *actito*, Lat.) Action quick and frequent

**To ACTIVATE** *v a* (from *active*) To make active (*Bacon*)

**ACTIVE** *a* (*activus*, Lat.) 1 That has the power or quality of acting (*Newton*) 2 That which acts, opposed to passive (*Donne*) 3 Busy, engaged in action (*Denham*) 4 Practical, not merely theoretical (*Hooker*) 5 Nimble, agile, quick (*Dryden*)

**ACTIVE**, in grammar, is applied to such words as express action, and is therefore opposed to passive. The active performs the action, as the passive receives it. Thus we say, a verb active, a conjugation active, &c. or, an active participle

**ACTIVE VERBS**, are such as do not only signify doing, or acting, but also nouns following them, to be the subject of the action or impression thus, to love, to teach, are

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verbs active, because we can say, to love a thing, to teach a man. Neuter verbs also denote an action, but are distinguished from active verbs, in that they cannot have a noun following them such are, to sleep, to go, &c. Some grammarians, however, make three kinds of active verbs the transitive, where the action passes into a subject distinct from the agent, reflected, where the action returns upon the agent, and reciprocal where the action turns mutually upon the two agents who produced it

**ACTIVELY** *ad* (from *active*) Busily, nimbly

**ACTIVNESS** *s* (from *active*) Quickness, nimbleness (*Hall*)

**ACTIVITY** *s* (from *active*) The quality of being active (*Bacon*)

*Sphere of Activity* is the space which surrounds a body, as far as it efficacy or virtue seems to extend to produce any sensible effect. Thus we say the sphere of activity of a lodestone, of an electric body, &c. With regard to chemical affinity its action extends indefinitely about each molecule of a body. But as it diminishes very rapidly, so that beyond a very small distance it ceases to be appreciable, we regard it as nothing at that term, and call sensible sphere of activity that whose centre is confounded with that of the particle, and whose radius is equal to the distance just mentioned

**ACTIUM**, a town and promontory of Epirus famous for the naval victory which Augustus obtained over Antony and Cleopatra, the 2d of September, B.C. 31, in honour of which the conqueror built there the town of Nicopolis and instituted games

**ACTIUS** is a name of Apollo, from Actium, where he had a temple. Virgil

**ACTIVUS NEXUS**, an augur who cut a whetstone in two with a razor, before Tarquin and the Roman people, to convince them of his skill in augury

**ACTON** East and West, two villages in Middlesex about 10 miles from London. East Acton is celebrated for its medicinal wells

**ACTON BUTT**, a village in Shropshire, three miles from Great Wenlock. A parliament was held here in the reign of king Edward I when the famous act called Statute Merchant was renewed

**ACTOR** *s* (*actor*, Lat.) 1 He that acts, or performs any thing. (*Bacon*) 2 He that personates a character, a stage player (*Ben Jonson*) The drama in its original, only consisted of a simple chorus who sung hymns in honour of Bacchus, so that the primitive actors were no more than singers and musicians. Thespis was the first who took upon him to introduce a persona, or actor, who was to ease the chorus by reciting the adventures of some of the heroes. Thus came the recitation or declamation in use Æschylus, finding a single person tiresome, thought to entertain the audience more agreeably by the introduction of a second person, who should con-



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verse and conduct dialogue with the first. He likewise dressed his actors more decently than they had been before, and put on them the buskin and the mask. Sophocles, finding the two persons of *Aeschylus* too few for the variety of incidents, added a third, and here the Greeks stopped. At least, we seldom find in any of their tragedies above three persons in the same scene. They might probably think it wrong to admit more than three speakers at the same time on the stage, a rule which *Horace* has expressed in the following verse of his *Art Poet*.

—“*Nec quarta loqui persona liboret*.”

In their comedies they took a greater liberty. The moderns have introduced a much greater number of actors upon the stage. This heightens the trouble and distress that should reign there, and makes a diversity in which the spectator is sure to be interested.

**ACTRESS** *s* (*actrice*, *Fr*) 1 She that performs any thing (*Addison*). 2 A woman that plays on the stage. *Actress*, or female actors, were unknown to the ancients among whom men always performed the female characters, and hence one reason for the use of masks among them. In England it is well known, that for many years after the time of *Shakspeare*, female characters were represented by boys or young men. *Sir William D'Avenant* in imitation of the foreign theatre first introduced females in the scene, and *Mrs. Betterton* is said to have been the first woman that appeared on the English stage. *Andrew Penny* played the part of *Mitridates* in a tragedy of *Ovenport*, in 1611, and *Mrs. Kynston* acted several female parts after the Restoration. *Downes*, a contemporary of his, assures us that being then very young, he made a complete stage beauty performing his parts so well, particularly *Antiope* and *Alfonsus*, that it has since been disputable among the critics whether any woman that succeeded him attracted the audience so sensibly as *Kynston* did.

**ACTS OF THE APOSTLES**, a canonical book of the New Testament, which contains great part of the lives of *St. Peter* and *St. Paul*, commencing at the ascension of our Saviour, and continued down to *St. Paul's* arrival at Rome, after his appeal to *Cæsar*, comprehending in all about thirty years. *St. Iulæ* has been generally taken for the author of this book, and his principal design in writing it was to obviate the false acts, and false history, which began to be dispersed up and down the world. The exact time of his writing it is not known, but it must have been at least two years after *St. Paul's* arrival at Rome, because it informs us that *St. Paul* dwelt two whole years in his own hired house, perhaps he wrote it while he remained with *St. Paul*, during the time of his imprisonment. The council of *Laodicea* places the Acts of the Apostles among the canonical books, and all churches have acknowledged it as such without any controversy. There were several spurious Acts of the Apostles, particularly, 1

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Acts supposed to be written by *Abdias*, the pretended bishop of *Babylon*, who gave out that he was ordained bishop by the apostles themselves when they were upon their journey into *Persia*. 2 The Acts of *St. Peter* this book came originally from the school of the *Abonites*. 3 The Acts of *St. Paul*, which is entirely lost. *Eusebius*, who had seen it, pronounces it of no authority. 4 The Acts of *St. John the Evangelist*, a book made use of by the *Encratites*, *Manichæans*, and *Priscillanists*. 5 The Acts of *St. Andrew*, received by the *Manichæans*, *Encratites*, and *Apotactes*. 6 The Acts of *St. Thomas* the Apostle, received particularly by the *Manichæans*. 7 The Acts of *St. Philip* this book the *Gnostics* made use of. 8 The Acts of *St. Matthias*. Some have imagined, that the Jews for a long time had concealed the original acts of the life and death of *St. Matthias*, written in Hebrew, and that a monk of the abbey of *St. Matthias* at *Treves*, having got them out of their hand, procured them to be translated into Latin and published them. But the critics will not allow them to be authentic (*See Canon*). The truth and divine original of Christianity, may be deduced from a comparison of the Acts of the Apostles, with the other received books of the New Testament. To this end *Dr. Piley* has in his very masterly work, entitled *Hort. Pauline* brought to, other from the Acts of the Apostles, and from the different Epistles of *Paul*, such passages as furnish proof of undesigned coincidence, and which therefore, are so many independent proofs of the authenticity of both the Acts and those Epistles.

**ACTUAL** *a* (*actual*, *Fr*) 1 That which comprises action (*Shakspeare*). 2 Really in act, not merely potential (*Milton*). 3 In act, not purely in speculation (*Druiden*).

**ACTUAL** (*actualis*) This word is applied to any thing endowed with a property or virtue which acts by an immediate power inherent in it. It is the reverse of potential, thus a red hot iron or fire is called an actual entity, in contradistinction from entities which are called potential entities. Boiling water is actually hot, brandy producing heat in the body is potentially hot, though of itself cold.

**ACTUALITY** *s* (*from actual*) The state of being actual (*Chymic*).

**ACTUALLY** *ad* (*from actual*) In act in effect, really (*South*).

**ACTUALNESS** *s* (*from actual*) The quality of being actual.

**ACTUARY** *s* (*actuarius* *Lat*) The register, or officer, who compiles the minutes of the proceedings of a court (*Ayliffe*).

**To ACTUALIZE** *v a* (*from ago, actum, Lat*) To put into action (*Addison*).

**ACTUATE** *a* (*from the verb*) Put into action, brought into effect (*South*).

**ACTUOSE** *a* (*from act*) That has strong powers of action.

**ACTUS**, in the ancient agriculture the length of one furrow, or as far as a plough goes before it turns. *Plin lib xviii cap 3*.

## ACU

**ACTUS MINIMUS**, was a quantity of land 120 feet in length and four in breadth

**ACTUS MAJOR**, or **ACTUS QUADRATUS**, a square piece of ground, whose side was equal to 120 feet

**ACRUS INTERVICINALIS**, a space of ground four feet in breadth, left between the lands in a path or foot-way

**ACUANILIS**, called more frequently **Marnichee**. They took their name from **Acua**, a disciple of Thomas the apostle

**ACUBENE**, in astronomy, the star marked  $\alpha$  in Cancer

**ACULLATE** *a* (*aculeatus*, Lat.) That has a point or sting, prickly

**ACULLI** *s* The prickles of animals, or of plants

**ACULIFOUS** *a* See **ACULFATE**

**ACULER** a French word frequently made use of in the academies, signifying that a horse when working upon volts, does not go far enough forwards at each motion so that his shoulders embrace or take in too little ground and his croup comes too near the centre of the volt

**ACUMEN**,  $\alpha\kappa\upsilon\mu\epsilon\nu$ , in the ancient music was used to signify a sound produced by the vibration, or tuning of the voice. This word is now commonly applied to sharpness or quickness of intellect

**ACUMEN** (from *acuo* to sharpen) A sharp point. In anatomy, the pointed protuberance of various bones

**ACUMINATED** *part* Ending in a point, sharp-pointed

**ACUPUNCTURE** the name of a surgical operation among the Chinese and Japanese performed by pricking the part affected with a silver needle to excite inflammation. They employ this in head-aches, convulsions, colics, &c

**ACUPSOUS** ( $\alpha\kappa\upsilon\psi\omicron\upsilon\varsigma$ , from  $\alpha$  neg and  $\kappa\upsilon\psi\mu$  *Tenus*) Chast, unaddicted to venery

**ACUSTIC** (*acusticus*  $\alpha\upsilon\omicron\upsilon\tau\iota\kappa\omicron\varsigma$ , from  $\alpha\kappa\upsilon$  *a to hear*) Acoustic, appertaining to the sense of hearing

**ACUT**, sharp **Acutus**. In botany ending in an acute angle. Applied to leaves and to the paranth in primula, &c

**ACUTE** *a* (*acutus* Lat.) 1 Sharp, opposed to blunt (*foete*) 2 Ingenious opposed to stupid (*foete*) 3 Vigorous, powerful in operation (*foete*)

**ACUTE ACCENT** See **ACCENT**

**ACUTE ANGLE**, in geometry is that which is less than a right angle, or does not sub tend 90 degrees

**ACUTE-ANGLED TRIANGLE**, is a triangle whose three angles are all acute. Every triangle must have, at least two acute angle

**ACUTE-ANGLED CONE**, is that whose opposite sides make an acute angle at the vertex, or whose axis in a right cone makes less than half a right angle with the side

**ACUTE DISASI** *Morbis acutus* A disease which is attended with an increased velocity of the blood, terminates in a few days, and is generally accompanied with danger. It

## ADÆ

is opposed to a chronic disease, which is slow in its progress, and not so generally dangerous

**ACUTE**, in music a term applied to any sound that is sharp, or high, in respect of some other. This word stands opposed to grave, and the consideration of sounds as grave and acute constitutes time

**ACUTELY** *ad* (from *acute*) After an acute manner sharply (*foete*)

**ACUTENESS** *s* (from *acute*) 1 Sharpness 2 Force of intellect (*foete*) 3 Quickness and vigour of senses (*foete*) 4 Violence and speedy crisis of a malady (*Bro*) 5 Sharpness of sound (*Boyle*)

**ACUTIAIOR** in writers of the barbarous times denotes a person that whets or grinds cutting instruments

**ACUTIS** ( $\alpha\kappa\upsilon\tau\iota\varsigma$ , from  $\alpha$  neg and  $\kappa\omega\upsilon$  *to conceal*) Defect in the sexual powers, barrenness

**ACYROLOGIA**, denotes in improper acceptance or expression wherein a word or phrase is used in some unusual or oblique sense, hardly reducible to the rules of language

**AD**, a Latin preposition, originally signifying *to*

**ADBESTIOS** in antiquity, the punishment of criminals condemned to be thrown to wild beasts

**AD EXTRA**, and **AD INTRA**, terms used by school divines. The former is applied to those operations of the Supreme Being, whose term or effect is not within his essence, the latter to such whose term or effect is within his essence

**AD HOMINEM**, among logicians is applied to a kind of argument drawn from the belief, the principles, or the prejudices of those argued with

**AD LIBITUM**, in music, an expression which gives the performer liberty at that part of the composition where it is written to give way to the directions of his own fancy

**AD IUDOS**, a Roman sentence whereby criminals were condemned to entertain the people, by fighting with beasts, or with each other

**AD METALLA** the punishment of such criminals (called metallic) is were condemned to work in the mines

**AD QUIDDITIES** among schoolmen, the attributes of thing which answer to the question *ad quid?* *to what?* They differ from mere quiddities which answer to the question *quid sit?* *what is it?* The former enquire what things are, *ad cha*, the latter what they are in themselves

**AD VALOREM**, a term chiefly used when speaking of the duties or customs paid for certain goods which are taxed according to their value

**ADAGYIUS** ( $\alpha\delta\alpha\gamma\iota\omicron\upsilon\varsigma$ , from  $\alpha$  neg and  $\gamma\alpha\gamma\omicron\lambda\omicron\varsigma$  *a fuger*) A term applied to animals without claws

**ADAMONIA** ( $\alpha\delta\alpha\mu\omicron\iota\alpha$  from  $\alpha$  priv and  $\delta\alpha\mu\omicron\omega$ , *a genus*, or *fortune*) In medicine, inquietude, restlessness, anxiety, perturbation

## A D A

**ADAGE** *s* (*adagium*, Lat) A proverb, a maxim, a popular saying

**ADAGIO**, in music, a word used to denote a degree or distinction of time it is generally applied to music, not only meant to be performed in a slow time but also with grace and embellishment It is likewise frequently used substantively, as when we say "an adagio of Corelli"

**ADAI** **IDL**s, in the Spanish policy, officers of justice for matters relating to the military forces

**ADAM**, in Scripture history, the first man whom God created and the original parent of the whole human race He was formed by an immediate act of divine power, out of the dust of the ground, as his name imports and God breathed into his nostrils the breath of life, so that he became a living soul, or person He was placed in the garden of Eden, and, in process of time, probably after some experience of the inconveniences of solitude, he was provided with a suitable helpmate of the female sex, called Eve The particulars of the history of these our first parents, are too numerous and too interesting to be detailed in small compass, we therefore refer to the first five chapters of the book of Genesis Adam died at the age of 930 years The etymology of the name Adam, the time of the year in which he was created, the vigour of his intellectual faculties, &c have been made the subject of many tedious discussions and fanciful conjectures into which we shall not enter as they would be of no benefit to the general reader

**ADAMANT**, **ADAMAS**, an ancient name for a precious stone by us called the diamond, it is also used to denote a species of iron, or the hardest and most highly tempered part of that substance, and sometimes it is applied to the magnet or loadstone

**ADAMANTA**, a kind of earth, supposed at first by Klaproth to be a distinct genus but afterwards designated by him to be only a compound of alumine and silica

**ADAMANTIAN** *a* (from *adamant*) Hard as adamant (*Milton*)

**ADAMANTINE** *a* (*adamantinus*, Lat) 1 Made of adamant (*Dryden*) 2 Having the qualities of adamant, as, hardness, indissolubility (*Davies*)

**ADAMANTINE** In Gmelin's system of oryctology in order of the class earths, ordinarily characterised is consisting chiefly of corunda or adamantine earth, existing here, but, hard lamellar

**ADAMANTINE SPAR**, or **CORUNDUM** a very hard stone found in China, and in the East Indies near Bombay There are two varieties of this stone, which were analysed, after considerable difficulty, by Klaproth who found that from China to contain 84 parts of alumine, 75 oxyd of iron 65 of silica and that from India 49 5 parts of alumine, 120 oxyd of iron, and 55 of silica Adamantine spar exists naturally both in mass and in crystals That brought from Benar, in the former state, is of

## A D A

a purplish hue and compact fracture, and its specific gravity 3 876, that from Coromandel is of a foliated texture, appears to be confusedly crystallized, and is of the specific gravity 2 785 Crystals of this spar are procured both from India and China, those from India are generally the purest The usual form of these crystals is that of a regular hexadral prism of a rough surface, and little external lustre, but they are occasionally met with in other forms (*See CRYSTALLIZATION*) The colour of the Indian variety is grey, with shades of green and light brown, in thin pieces, and at the edges of the crystals it is semitransparent, it is brittle, and so hard as to cut rock-crystal and most of the gems its specific gravity is from 3 950, to 3 990 The Chinese crystals differ from these in containing grains of magnetic iron ore, in being generally of a darker colour, and in having a superior gravity though inferior in hardness The use of adamantine spar, throughout India and China, is that of polishing steel and gems for which its great hardness renders it peculiarly proper This substance is said to have been found in France, by count Bourneon, at Tine, one of the Hebrides, by Mr Raspe, and very lately at Chesnut hill, about ten miles from Philadelphia, by Mr Adam Seybert

**ADAMANTINUS** In oryctology, the only genus of the class earth order adamantine consisting of adamantine earth the latter spar, alumina a little silica and iron very hard, ponderous and lamellar, with strict isolations interlocking each other in a triple manner, breaking into rhomboid fragments, perfectly apical, and yielding a little to the file The only known species is the a corundum, diamond spar adamantine spar Corunda of Klaproth Imperfect corundum of Thomson Found in China, Bombay, France, and Spain in granite colour grey, with often various shades of green, blue, and brown, lustre transparent, and when polished, shines like mother of pearl, is sometimes found massive, but most commonly in six-sided prisms, and simple, acute, six-sided, truncated, pyramids It is used like diamond, however, for cutting and polishing hard minerals

**ADAMAS** The diamond A genus of the Gmelinian class earths, order siliceous Consists of silica and carbon, slightly ponderous, extremely hard, lamellar, exhibiting a high peculiar lustre, breaking into indeterminate fragments, parietal, shining in the dark after being exposed to the rays of the sun, attracting light bodies when rubbed, or heated, crackling and losing its transparency in the fire, and at 140° or 150° of Wedgwood's pyrometer, beginning to burn, till at length it entirely evaporates Eight species from difference of prism The adamas, or diamond, is found in Borneo, the provinces of Golconda and Visapour, and at the foot of the Orissa mountains in Bengal in South America, in the district of Terra do Frio in Brazil, generally in loose sand, or inclosed in a loam earth, very

## A D A

rarely aggregate, or attached to other fossils. Of all mineral substances, it possesses the greatest degree of hardness, transparency, and lustre. fracture straight, and perfectly foliated. It is either colourless, or red, greenish, yellowish, brownish, black, or steel blue, with sometimes specks or clouds. It is of all gems the most precious, and from its entirely consuming like an inflammable substance, may probably be considered as a very pure species of coal.

**ADAMAS** (*αδαμας*, from *α* neg and *δαμαω*, to conquer, as not being easily broken) The adamant, or diamond, formerly supposed to be posset of extraordinary medical virtues.

**ADAMAS**, in astrology, a name given to the moon.

**ADAMIC EARTH**, *terra adamica*, a name by which some call the common red clay, supposed to be the adamah, or red clay, of which the first man was formed.

**ADAMITES** in ecclesiastical history the name of a sect of ancient heretics, supposed to have been a branch of the Basilidians and Garpocratians.

**ADAMITUM** (from *adamas*) Any stone resembling the hardness of the diamond. Sometimes applied to urinary calculi.

**ADAMS** (*George*), an ingenious optician and natural philosopher, was born about the year 1730. We have not been able to obtain any particulars respecting his early life. At about thirty years of age we find him much celebrated as a maker of mathematical and philosophical instruments. His shop was in Fleet-street, and was much resorted to. The writer of this article, his with many others, been highly delighted with the ease, accuracy, goodness, and unassuming modesty, with which he explained the nature and use of any particular instrument. When the purchaser requested such explanation. He published Essays on the Microscope, Essays on Electricity and Magnetism, A treatise on the Geographical Essays, Geometrical and Graphical Essays, An Essay on Vision, Lectures on Natural and Experimental Philosophy, five volumes octavo. Appendix to the Geometrical and Graphical Essay. He had projected other performances, but was prevented from executing them by death, which put a close to his useful labours, at Southampton, August 11, 1791, aged 40. He was a man of immense and communicative disposition, which endeared him to all who had the pleasure of knowing him. His life had been devoted to religious and moral duties, to the acquisition of science, and its diffusion for the benefit of mankind. To those who had no personal knowledge of Mr Adams, his works will continue to display not only his merits as an author, but his virtues as a valuable member of society.

**ADAMS APPLE** See **POMUM ADAMI**, and **CITRAS**.

**ADAMS NEEDLE** The roots of this plant, yucca gloriosa of Linnaeus, are thick and tuberculous, and are used by the Indians instead of bread, being first reduced into a coarse meal.

## A D D

This, however, is only in times of scarcity. See **YUCCA**.

**ADAMUS**, the name given by alchemists to the philosopher's stone.

**ADANSONIA** *Sour-gourd*, monobibuloid. So called after the African traveller Adanson. A genus of the Linnaean class and order monadelphous polyandria, thus characterized: calyx single, deciduous; style very long; stigma numerous; capsule woody, ten celled, seeds numerous, imbedded in fleshy mucous pulp. The only known species was discovered by Adanson on the banks of the Senegal. It produces the terra sigillata lemnia.

*To ADAPTI* *a* (*adapto*, Lat.) To fit to suit, to proportion (*Swift*).

**ADAPTIATION** *s* (from *adapt*) The act of fitting one thing to another, the fitting of one thing to another (*Boyle*).

**ADAPTION** *s* (from *adapt*) The act of fitting (*Chryse*).

**ADAR**, in the Hebrew chronology, the twelfth month of their ecclesiastical year, and the sixth of their civil year. It contains nineteen and twenty days, and runs its course between the month of March.

**ADARCON** a gold coin mentioned in Scripture worth about fifteen hillari.

*To ADD* *a* (*addo*, Lat.) To join something to that which was before. *2* To perform the mental operation of adding one number or one thing to another (*Locke*).

*To ADDI* (*IMAJI* *a* (*addecimo*, Lat.) To take or ascertain tithes.

*To ADDEIM* *v* *a* (from *decem*) To estimate to account out of use (*Daniel*).

**ADDIPHAGIA** (*αδδιφαγια*, from *αδδ*, largely, and *φαγω* to eat) Ravenous appetite. Bulimia.

**ADDITR** *s* (*αδδτρ*, Six persons) A serpent, a viper, a poisonous reptile (*Taylor*). See **COLUMBER**.

**ADDITR FONGUE** See **ORIHOGLOSSUM**.

**ADDER'S WORT** See **POLYCONUM**.

**ADDITIONARIES** the pope's mitre-bearers, so called according to DuCange on account of their waiting at the pope's right hand when he retires to visit the churches.

**ADDIBILITY** *s* (from *addit*) The possibility of being added (*Locke*).

**ADDIBLE** *a* (from *add*) Possible to be added (*Locke*).

**ADDIT** *s* (from *ad*, to, and *dicere*, Sax.) A kind of use (*Boetius*).

*To ADDICI* *a* (*addico* Lat.) 1 To devote, to dedicate (*Seneca*). 2 It is commonly taken in a bad sense, viz. he addicted himself to vice.

**ADDICTEDNESS** *s* (from *addicere*) The quality or state of being addicted (*Boyle*).

**ADDICTI**, in Roman antiquity, slaves who were reduced to that state because they could not satisfy some creditor, whose slave they became till they could pay or work out the debt.

**ADDICTIO** ADDICTION, in the Roman law, a transferring, or putting over goods to

another, whether by sentence of a court, or in the way of sale, to him that bids most for them

**ADDICTIO IN DIEM**, denoted the adjudging of a thing to a person for a certain price, unless by such a day the owner, or some other person, gave more for it

**ADDICTION** *s* (*addictio*, Lat.) 1 The act of devoting, or giving up 2 The state of being devoted (*Shakspeare*)

**ADDISON** (Joseph), was born at Mils-ton, near Ambresbury, Wilts, on May 1, 1672, and being unlikely to live, was baptized the same day. After receiving the rudiments of education at different schools, he was sent to the Charter-house, where he contracted an intimacy with Mr Richard Steele. In 1687, he was admitted of Queen's college, Oxford, and two years afterwards into Middle temple. In 1693, he took his degree of M.A. and became eminent for his Latin poetry. In his twenty-second year, he addressed some verses to Dryden in English, and not long after published a translation of the greatest part of Virgil's fourth *Georgic*. About this time he wrote the arguments prefixed to the several books of Dryden's Virgil, and composed the essay on the Criticism. In 1690, he addressed a poem to King William, which recommended him to Lord Somers. In 1699, he obtained a pension of 500*l*. a year, to enable him to travel. He went leisurely through France and Italy, improving his mind to the best advantage, as appears from his "Letter to Lord Halifax," reckoned the most elegant of his poetical performances, and his Travels in Italy, which he dedicated to his retirement to Lord Somers. He returned home in 1702, and found his old friends out of place. In 1714 Lord Godolphin was lamenting to Lord Halifax that the victory at Blenheim had not been celebrated as it ought to have been, and desired him to recommend a good poet, who, he said, should not go unrewarded. Halifax proposed Addison, who set about it with vigour, and while he was writing, his "Campania" the treasurer was so pleased with it, that he appointed him to succeed Mr Locke as commissioner of appeals. In the next year, he was at Hanover with Lord Halifax, and the year following became under-secretary of state. The rage for Italian operas which then prevailed induced him to write his "Rosamond," which did not succeed, probably because it was English. When the marquis of Wharton went to Ireland as lord lieutenant, Addison accompanied him a secretary, and was made keeper of the records there, with a salary of 100*l*. a year. While he was in Ireland Steele commenced the paper to which Addison officially contributed. This was followed by the Spectator, which was enriched by the contributions of Addison, whose papers are distinguished by one of the letters of the word CIO. In 1715, his tragedy of Cato was brought upon the stage, amidst the plauds of both whigs and tories. Cato was praised by most of the contemporary poets or touched by Deans, attacked

as a party play at Oxford, and vindicated by Dr Sewel. It was translated into Italian, and performed at Florence, and into Latin at the college of St Omers. At this time the Guardian appeared, to which Addison largely contributed, whose papers are marked by a hand. But the violence of politics soon put a stop to this paper, and Addison himself engaged in the party warfare, but his political pieces being on temporary topics, soon sunk into neglect. An attempt was made to revive the Spectator, but after the publication of eighty numbers, which compose the eighth volume, the work was relinquished. Addison's quota amounts to about a fourth part. December 23, 1715, he began the Freeholder, and continued it till the middle of the next year in defiance of the government. In August 1716 he married the countess dowager of Warwick after a long courtship, but much happiness did not result from this connection.

The following year he was appointed a secretary of state to George I. but his health, which had before been impaired by an asthmatic disorder, suffered by his advancement, on this account, together with his want of courage to speak in public (as some assert), he resigned this office. In his retirement, he applied himself to the writing of a Treatise in Defence of the Christian Religion, part of which appeared after his death, and makes us regret that he did not live to perfect it. We have been told that he had, likewise, formed the design of compiling an English Dictionary, but this he never began, for a severe relapse put a period to his life on the 17th of June 1719 in the 48th year of his age. A little before his death, he had an interview with his former pupil the young earl of Warwick, of which Dr Young gave the following account. After a long and manly, but vain struggle with his distemper, he dismissed his physicians, and with them all hopes of life. But with his hopes of life he dismissed not his concern for the living, but sent for a youth nearly related, and finally accomplished, but not above being the better for good impressions from a dying friend. He came, but life now glimmering in the socket the dying friend was silent after a decent and proper pause, the youth said, "Dear sir! you sent for me, I believe, and hope, you have some commands, I shall hold them most sacred. My distant ages not only bear but feel, the reproach forcibly grasping the youth's hand, he softly said, "See in what peace a Christian can die. He spoke with difficulty and soon expired. We shall not enter into a critique of Addison's writings, but shall conclude with the words of Dr Johnson, who after drawing his character in a forcible and elegant manner, says, "whoever wishes to attain an English style, familiar but not coarse, and elegant but not ostentatious, must give his days and nights to the volumes of Addison.

**ADDIAMENT**, something added to another. Thus physicians call the ingredients added to a medicine already compounded, addi-  
aments

## A D D

**ADDITAMENTUM** (from *addo*, to add) The same as **EPIPHYSIS**, which see

**ADDITAMENTUM COLLI** See **APPENDICULA CÆCI VERMIFORMIS**

**ADDITION**, the act of joining one thing to another, or of augmenting a thing, by the accession of others

**ADDITION** is also used for the thing added with itself

**ADDITION**, in arithmetic, is the first of the four fundamental rules of that science. It is, in fact, the finding of the most simple expression in the established notation, equivalent to the sum of certain numbers. Simple addition may be performed by this rule

*Example*

Write the numbers distinctly, units under units, tens under tens, and so on. Then reckon on the amount of the right-hand column. If it be under ten, mark it down. If it exceed ten, mark the units only, and carry the tens to the next place. In like manner, carry the tens of each column to the next and mark down the full sum of the left hand column

346863
876734
123467
314213
712316
435087
279654
3002234

One of the best methods of proof, is to separate the numbers into two or three smaller parcels: then to find the sum of each parcel, and the aggregate of those sums corresponds with the total of the original operation, the work is right

**COMPOUND ADDITION**, is that by which numbers of different denominations, are collected into one sum

*Rule*

1 Place the numbers so that those of the same denomination may stand directly under each other, and draw a line below them. Add up the figures in the lowest denomination, and find how many ones of the next higher denomination are contained in their sum. 3 Write down the remainder, and carry the ones to the next denomination, with which proceed as before, and so on, through all the denominations to the highest, whose sum must be all written down, and this sum, together with the several remainders, is the total sum required

*Examples*

<i>l</i>	<i>s</i>	<i>d</i>	<i>Yards</i>	<i>Feet</i>	<i>Inch</i>
84	17	0½	327	1	6
32	11	4½	428	2	9
57	6	7	72	1	8
25	13	2½	43	0	7
73	0	4½	6	2	11
273 9 1			879	0	5

**ADDITION OF FRACTIONS** First reduce the fractions to their simplest form, also to a common denominator, if their denominators are different, then add all the numerators together, and set the sum over the common denominator, for the sum of all the fractions is required

Thus,  $\frac{2}{7} + \frac{3}{4} = \frac{8}{28} + \frac{21}{28} = \frac{29}{28} = 1\frac{1}{28}$   
And  $\frac{1}{2}$  of  $\frac{2}{3} + \frac{1}{5}$  of  $\frac{2}{6} = \frac{1}{3} + \frac{1}{6} = \frac{2}{6} + \frac{1}{6} = \frac{3}{6}$

## A D D

**ADDITION OF DECIMALS**, is performed by arranging the numbers so that the decimal points fall under each other, and then proceeding as in simple addition

Thus to add 4 625, 15 75, 168 5 25 674, and 71921 together, let them be placed and summed as in the margin

4 625
15 75
168 5
25 674
71921
81 20721

**ADDITION OF CIRCULATING DECIMALS**, may be performed by converting each of them into its equivalent vulgar fraction, and finding the sum of such fractions. But the following rule is easier, and full as accurate. make the repetends similar and contemporaneous and arrange them so that the decimal points fall under each other then in adding, first reckon up about three of the left-hand columns of the circulating part, and let the tens which arise from the list of these, be carried as so many units to the right hand column of the circulate, after which the whole must be added as in common addition

*Example*

Add 3 6 78 3176, 42 54 and 1, 5 together

<i>Decimal</i>	<i>Sum</i>	<i>Integer</i>
3 6	=	3 600000
78 3176	=	78 3176176
42 84	=	42 848448
1 5	=	1 5000000

1's sum 140 3627091

Here, when the three left hand columns of the circulate are summed the last amounts to 16, from which 1 is carried to the right hand column

**ADDITION**, in algebra, is the uniting or incorporating of indeterminate quantities, denoted by letters, into one contracted expression, or mass. The operation is performed by connecting the quantities together by their proper signs and uniting or reducing such as are susceptible of it, namely similar quantities, by adding their coefficients together if the signs are the same, but subtracting them when different. Thus the quantity *a* added to the quantity *b*, makes *a + b*, and *a* joined with  $-b$ , makes *a - b*, also  $-a$  and  $-b$  make  $-a - b$ , and 3 *a* and 5 *a* make 3 *a* + 5 *a* or 8 *a*, by uniting the similar numbers 3 and 5 to make 8

Thus also 3 *a* + 2 *bc* - 4 *a*<sup>2</sup>*b* + *c*<sup>3</sup>  
added to 2 *a* - 2 *bc* + 3 *a*<sup>2</sup>*b* + 2 *c*<sup>3</sup>  
makes - 5 *a* 0 - *a*<sup>2</sup>*b* + 3 *c*<sup>3</sup>

Also  $\frac{4a}{3c} + \frac{2a}{3c} = \frac{6a}{3c} = \frac{2a}{c}$ ,

and  $3\sqrt{ac} + 5\sqrt{ac} - 1\frac{1}{2}\sqrt{ac} = 6\frac{1}{2}\sqrt{ac}$ ,

and  $\frac{3a + 7\sqrt{2x}}{a + x} + \frac{7 - 3a\sqrt{2x}}{a + x} = \frac{14\sqrt{2x}}{a + x}$ ,

## A D D

$$\text{and } \frac{8a\sqrt{ax}}{a+2c} + \frac{16c\sqrt{ax}}{a+2c} = \frac{8a+16c\sqrt{ax}}{a+2c} = 8\sqrt{ax},$$

and  $+3-2=1$ , and  $-3+2=-1$ ,

$$\text{and } \frac{7ax}{b} - \frac{4ax}{c} = \frac{7acx}{bc} - \frac{4abx}{bc} = (7c-4b) \frac{ax}{bc}$$

**ADDITION OF ALGEBRAIC FRACTIONS**  
See FRACTIONS

**ADDITION OF SURDS** See SURDS

**ADDITION OF LOGARITHMS** See LOGARITHMS

**ADDITION OF RATIOS** See COMPOSITION

**ADDITION OF CONCORDS** See CONCORD

**ADDITION OF FORCES**, is or ought to be, made use of, to express the sum of two or more forces when the directions in which they act coincide. For, if two forces act in the same direction, we cannot, with propriety, speak of their composition into a third, since that implies a difference in the direction, while, in this instance, the direction remains unchanged, and the force is increased in full proportion to the sum of the combined powers. See COMPOSITION.

**ADDITIONS**, in distilling, a name given to such things as are added to the wash, or liquor, while in a state of fermentation, to improve the viscosity of the spirit, produce a larger quantity of it, or give it a particular flavour. Of these additions there are four kinds, salts, acids, aromatics, and oils, and sometimes, by prudent management, a large proportion of rectified spirit may also be introduced with advantage. See DISTILLATION.

**ADDITION**, in law, is that title which is given to a man over and above his proper name and surname, to show of what estate, degree, or profession he is, and of what town, village, or country.

**ADDITIONS OF ESTATE, OR QUALITY**, are, yeoman, gentleman, esquire, and such-like.

**ADDITIONS OF DEGREE**, are those we call names of dignity, as knight, lord, earl, marquess, and duke.

**ADDITIONS OF MYSTERY**, are such as scrivener, painter, mason, and the like.

**ADDITIONS OF PLACE**, are, of thorp, of dale, of wood stock. When a man hath household in two places, he shall be said to dwell in both, so that his addition in either may suffice. Knave was anciently a regular addition.

**ADDITIONS**, in heraldry, denote a kind of bearings, in coats of arms, wherein are placed rewards, or additional marks of honour.

**ADDITIONAL** *a* (from *addition*) That is added (*Addison*).

**ADDITIONAL** denotes something to be added to another. Thus astronomers speak of additive equations, namely, those which added to the sun's mean anomaly, give the true one.

**ADDITIONAL** *a* (from *add*) That has the power or quality of adding (*Arbutnot*).

**ADDLE** *a* (from *adel*, *a disease*, Sax

## A D E

*Skinner*, perhaps from *yael*, *idle*, *barren*, *unfruitful*) Originally applied to eggs, and signifying such as produce nothing, thence transferred to brains that produce nothing (*Burton*).

**To ADDLE** *b a* (from the adjective) To make addle, to make barren (*Brown*).

**ADDLE-PATED** *a* Having barren brains (*Dryden*).

**To ADDRESS** *v a* (*addresser*, Fr) 1 To prepare one's self to enter upon any action (*Shakspeare*) 2 To get ready (*Hayward*) 3 To apply to another by words.

**ADDRESS** *s* (*addressee*, Fr) 1 Verbal application to any one, petition (*Pr*) 2 Courtship (*Addison*) 3 Manner of addressing another 4 Skill, dexterity (*Swift*) 5 Manner of directing a letter.

**ADDRESSEE** *s* (from *address*) The person that addresses or petitions.

**ADDUCIOR** (from *ad*, and *duco*, to draw to) A name given to various muscles, whose office is to approximate those parts of the body to which they are annexed.

*Adductor additimum digiti*, a muscle of the little finger.

*Adductor auris*, a muscle of the ear.

*Adductor brachii*, a muscle of the arm.

*Adductor digiti minimi pedis*, a muscle of the little toe.

*Adductor femoris primus vel longus*, a muscle of the thigh.

*Adductor femoris secundus vel brevis*, a muscle of the thigh.

*Adductor femoris tertius vel magnus*, a muscle of the thigh.

*Adductor femoris quartus*, a muscle of the thigh.

*Adductor indicis*, a muscle of the forefinger.

*Adductor oculi*, a muscle of the eye.

*Adductor pollicis manus ad indicem*, a muscle of the thumb.

*Adductor pollicis pedis*, a muscle of the great toe.

**ADECTA** (from *a neg* and *dectus*, to bite) Medicines that remove the biting sensations produced by pain. Emollients.

**ADEL**, or **ZEILA**, a kingdom in Africa, bounded on the south by Magadoxo, on the east by part of the Eastern ocean, on the north by the straits of Babelmandel, and on the west by the Gallees. This country abounds with wheat, millet, frankincense, and pepper. The inhabitants are Mahometans. Adel, its capital, is situated about 300 miles south of Mocha. Lat 8 5 N Lon 44 20 E.

**ADFLIA** In botany, a genus of the Linnean class and order, diccia gynandria, thus generically characterised male calyx, three-parted, corolless stamens numerous united at the base. Female calyx, five-parted, corolless, styles three, lacerated, capsule three-grained. It is a native of Jamaica, which offers three species.

**ADELOUS** (*adelus*, *αδελος*, from *a neg* and *delos*, manifest) In medicine, insensible, imperceptible, as applied chiefly to cutaneous perspiration.

## A D E

**ADELPHIA** (*αδελφία*, from *αδελφος*, a brother) In medicine, similarity of diseases

**ADELPHIANA** s A sect of ancient heretics, who always fasted on Sundays

**ADELPHIXIS** (*αδελφίξις*, from *αδελφος*, brother) Sympathy, or consent of parts

**ADEISCALE**, in ancient customs, a servant of the king

**ADEPTION**, **ADEPTIO**, in the civil law, the revocation of a grant, donation, or the like The adeption of a legacy may be either express, as when the testator declares in form, that he revokes what he had bequeathed or tacit, as when he only revokes it indirectly, or implicitly See **RECISSION**

**ADEN** (*αδην*, a gland) A gland

**ADENANTHERA** Bastard flower-fence In botany, a genus of the Imanian class and order decandria, monogynia, thus characterised calyx five-toothed, petals five, anthers incumbent, bearing a globular gland at the outer tip, legume membranaceous It is a native of the East Indies, and furnishes three species

**ADENIFORM** (*adeniformis*, from *αδην*, a gland, and *forma*, resemblance) Glandiform, or resembling a gland A term sometimes applied to the prostate gland It is a bad and illegitimate word, however as compounded of two distinct languages, and should be relinquished for adenoid, or glandiform

**ADENOGRAPHY** (*adenographia* *αδηνοςγραφία*, from *αδην*, a gland, and *γραφω*, to write) A treatise on the glands

**ADENOID** (from *αδην*, a gland, and *ειδος*, a likeness) Glandiform, resembling a gland

**ADENOLOGY** (*adenologia*, *αδηνολογία*, from *αδην*, a gland, and *λογος* a discourse) The doctrine of the glands See **GLANDS**

**ADENOS**, a kind of cotton often called marine cotton It comes from Aleppo by the way of Marsoules

**ADENOUS ABSCESS** (*abscessus adenosus*, from *αδην*, a gland) A hard glandular abscess, which suppurates slowly

**ADEONA** In mythology, the name of a goddess invoked by the Romans, when they set out upon a journey

**ADIPHAGIA**, the Sicilian goddess of gluttony

**ADEPS** An oily secretion from the blood into the cells of the cellular membrane See **FAT**

**ADEPTS**, **ADEPTI** from *adipisci*, to obtain, a name assumed by those proficient in alchemy, who engaged in researches after the philosopher's stone, and the universal medicine, or who pretended to have succeeded in these researches Though the extraneous projects of the alchemists had been invariably unsuccessful, yet in the sixteenth century a prodigious number of them appeared at the head of whom was Paracelsus, a Swiss physician, whose reveries were eagerly embraced by the rest This extraordinary man, in whom was united great energy of mind with great weakness and credulity, and a success in medicine almost unparalleled, with the utmost ar-

## A D H

dour and absurdity of expectation, revived the notion which Raymond Lully and other alchemists had entertained, of a universal medicine, capable of curing all diseases, in all times in all places, and in every variety of constitution and circumstance The eagerness and confidence with which Paracelsus pursued this object, engaged many others to co-operate with him, who without laying aside their former enquiries into the transmutation of metals and the making of gold, vied with each other in ardency to discover the universal remedy, and persuaded themselves that these several miracles might be effected by one chemical process With these views, which they expected to see realised and pretending besides that they were taught from heaven in some mysterious manner, they arrogated to themselves the title of adepts, which has ever since been applied to them as a term of derision The term adepts is also applied, in a more general and respectful sense, to those who are proficient in any kind of science

**ADEQUATI** a (*adæquatus*, Lat) Equal to, proportionate (*South*)

**ADEQUATELY** *ad* (from *adequate*) In an adequate manner, with exactness of proportion (*South*)

**ADEQUATENESS** s (from *adequate*) The state of being adequate, exactness of proportion

**ADIS**, or **HADES**, *αδης*, from *α* and *ιδω*, denotes the invisible state In the heathen mythology, it comprehends all those regions that lie beyond the river Styx, viz Erebos, Tartarus, and Phrygium (See **HELL**) The Greeks sometimes used the word *Ades*, to denote the god of hell the Pluto of the Latins Dr Campbell observes, that the word *ades* occurs eleven times in the New Testament, and is translated hell in all, except one, where it is translated grave He thinks, however, that it ought never in Scripture to be rendered hell, at least, in the sense applied to that word by Christians In the Old Testament the corresponding word is *sheol* (as in Ps xvi 5, 10) which signifies the state of the dead in general, without regard to their character or condition, either of happiness or misery Dr Doddridge entertains a similar opinion See his Family Expositor, vol 1 p 485 note f, where he refers to Mr How's works vol ii p 61 in proof that the word generally signifies the invisible world in general Indeed the primitive meaning of the Saxon word *hell* is much the same, and even now the verb to *hull* or to *hell*, is used in many parts of England as denoting to cover up or hide

**ADSENARIUM**, a name given to those who hold that Jesus Christ is really present in the eucharist but in a manner different from what the Romanists hold

**ADEQUATE EQUATION**, in algebra, an equation in which the unknown quantity is found under two or more different powers For example  $a^3 - m x^2 + n x = r$ , is an affected cubic equation

To **ADHIRE** *v* a (*adhereo*, Lat) 1 To



stick to 2 To be consistent, to hold together (*Shakspeare*) 3 To remain firmly fixed to a party, person, or opinion (*Shakspeare Boyle*)

**ADHÆRENCIA, ADHÆRENCY** *s* (from *adhere*) 1 The quality of adhering, tenacity 2 Fixedness of mind, steadiness, fidelity

**ADHÆRENT** *a* (from *adhere*) 1 Sticking to (*Pope*) 2 United with (*Watts*)

**ADHÆRENS** *s* (from *adhere*) A follower, a partisan (*Raleigh*)

**ADHÆRERE** *s* (from *adhere*) He that adheres

**ADHESION** (*adhesio* from *adhaere*, to stick) 1 A growing together of parts

**ADHESION** in philosophy and chemistry, a species of attraction which takes place between the surfaces of bodies, either similar or dissimilar, and which in a certain degree connects them together, thus water adheres to the finger, mercury to gold, two pieces of lead or brass to each other, &c. In this respect it is different from cohesion which, uniting particles to particles, returns together the component parts of the same mass. It has been proved that the power of adhesion is proportional to the number of touching points which depends upon the figure of the particles that form the bodies, and in solid bodies, upon the degree in which their surfaces are polished and compressed. The effects of this power are extremely curious, and in many instances astonishing. Musschenbroek relates that two cylinders of glass, whose diameters were not quite two inches, being heated to the same degree as boiling water, and joined together by means of melted tallow lightly put between, adhered with a force equal to 150 pounds. Lead of the same diameter, and in similar circumstances, adhered with a force of 27 pounds, and soft iron with one of 300 pounds (Musschenbroek's Philosophy, by Colson.) And Martin, in his Philosophia Britannica, vol. 1 says that with two leaden balls, not weighing above a pound each, nor touching upon more than  $\frac{1}{16}$  of a square inch surface, he has lifted more than 150 lb weight. The balls were first joined very finely with the edge of a sharp penknife and then equally pressed together with a considerable force and a gentle turn of the hand. The force of adhesion between two brass plates, each  $4\frac{1}{2}$  inches diameter, and smeared with grease of fat, was so great that Mr Martin asserts that he never could meet with two men strong enough to separate them by pulling against each other. These instances are sufficient to give an idea of the nature of this power: those who wish for more experiments may find them detailed in the two books referred to, in Supplement to the Encyclopedia Britannica, in Chemistry, p. 245, &c. and in Rees's Cyclopædia, in the article Adhesion. To measure the force of adhesion between different substances, and in different temperatures and circumstances, various methods have been contrived, but the best, that which was suggested by Dr Brook Taylor, whose experi-

ments led him to conclude that the force of adhesion might be determined by the weight necessary to produce a separation, and which has since been pursued and extended by M. de Morveau (now M. Guyton) with considerable success. He constructed a cylinder of different metals, perfectly round, an inch in diameter, and the same in thickness, having a small ring in their upper surface by which they might be hung exactly in equilibrium. These cylinders were suspended, one after another, to the beam of a balance, and when they counterpoised exactly, were applied to mercury placed about  $\frac{1}{2}$  of an inch below them. After sliding them along, the surface to prevent any air from lodging between them and the mercury, he marked exactly the weight necessary to overcome their adhesion, taking care to change the mercury after every experiment. The results were as follow.

Gold adheres to mercury with a force of 436 grs

Silver	420	Zinc	204
Tin	418	Copper	242
Lead	397	Antimony	126
Bismuth	372	Iron	115
Platina	282	Cobalt	8

This method which when it can be applied, is the most direct and accurate of all that have yet been devised, has been pursued to still greater lengths, and degrees of nicety by M. Achard and others, whose experiments our limits will not allow us to detail. From what has been done altogether we may deduce the following conclusions.—That there exists a tendency to adhesion between many, and probably between all substances in nature, absolutely independent of atmospheric or any other external pressure, that the force of this adhesion between solids is in the order of their chemical affinities, and between solids and fluids is in an inverse ratio to the thermometrical temperature, and a direct ratio to the squares of the surfaces, that every solid adheres with a peculiar force to each fluid, that this force is truly expressed by the weight necessary to break the adhesion in all cases where the solid comes out clear from the fluid, but that whenever any particles of the fluid adhere to the solid, the weight of the counterpoise is then expressive of the mixed forces of the adhesion between the surfaces of the solid and the fluid and of the cohesion between the component parts of the fluid.

**ADHESIVE** *a* (from *adhaere*) Sticking, tenacious

**ADHESIVE INFLAMMATION** A term lately introduced into surgery, to express that species of inflammation which terminates by an adhesion of the inflamed surfaces, thus the pleura of the lungs, when inflamed, unites to that of the ribs.

**ADHIBERE** *v a* (*adhibere*, Lat) To apply, to make use of (*Forbes*)

**ADHIBITION** *s* (from *adhibere*) Application, use

**ADHIL**, in astronomy, a small star under Andromeda's foot

## A D J

**ADHOA**, **ΑΔΟΗΑ**, or **ADHOGAMFN**-  
TUM, in ancient customs, denotes what is  
often called relief

**ADJACENCY** *s* (from *adjuceo*, I at)

- 1 The state of lying close to another thing
- 2 That which is adjacent (*Brown*)

**ADJACENT** *a* (*adjacens* I at) I lying  
close, bordering upon something (*Bacon*)

**ADJACENT** *s* That which lies next an-  
other (*Locke*)

**ADIANTHUM**, **ADIANTUM** (from *a*  
*neg* and *daivw*, to grow well, because its leaves  
are not easily wetted) Maiden-hair In bo-  
tany, a genus of the Linnéan class and  
order cryptogami, filices, thus character-  
ised fructification in distinct marginal dots  
or small lines, involucre membranaceous,  
distinct from the turned-in margin of the  
frond, opening towards the rib There are  
nearly forty species of this fern which may be  
divided into, 1 those with genuine capsules in-  
nate in the involucre, comprehending those  
with a simple frond, a compound frond, a  
frond decomposed, frond more than decom-  
pound 2 Those with spurious fructification  
in distinct marginal dots, covered with scale-  
like involucre, not innate The maiden-hair  
of the confectioners, is the *capillus vene-  
ris* It is somewhat sweet and auster  
to the palate and possesses mucilaginous qua-  
lities The syrup de capillaro is prepared  
from it

**ADIANTUM AURFUM** The plant which  
is thus called in the pharmacopœia is the  
*polytrem commune* a simple anthra-  
paraleliped the varieties of *p commune*  
of Linnæus It possesses in an inferior de-  
gree astringent virtues and was formerly  
given in diseases of the lungs and calculous  
complaints

**ADIAPHORISTS** in church history a  
time important lukewarm given in the  
sixteenth century, to the moderate Lutheri-  
ans

**ADIAPHOROUS** *a* (*adiaph*, *Gr*) Neu-  
tral (*Boyle*)

**ADIAPHORY** *s* (*adiaphora*, *Gr*) Neutra-  
lity, indifference

**ADIAPNOUSIA** (*adiapnoesia* *ad-*  
*spiro*, from *a priv* and *σπρω, to perspire*)  
A diminution or obstruction of the natural  
perspiration

**ADIB** (from *adil* Arab) The wolf  
whose liver is commended by Avicenna, upon  
the theory of sympathetic medicine, in all  
hepatic affections See **CANIS**

**TO ADJECT** *v a* (*adicio*, *adjectum*,  
I at) 1 To add to 2 To put to another thing

**ADJECTION** *s* (*adjectio* I at) 1 The  
act of adjecting, or adding 2 The thing ad-  
jected, or added (*Brown*)

**ADJECTITIOUS** *a* (from *adjection*)  
Added thrown in upon the rest

**ADJECTIVE** in grammar a kind of noun  
joined with a substantive, either expressed or  
implied, to shew its qualities or accidents  
The word is formed of the Latin *adjicere*, to

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*add to*, as designed to be added to a substan-  
tive without which it has no precise signifi-  
cation Butcher Bufler defines adjective in a  
manner somewhat different from other gram-  
marians—Nouns, according to him, are sub-  
stantives, when the objects which they repre-  
sent are considered simply, and in themselves,  
without any regard to their qualities on the  
contrary, they are adjectives, when they ex-  
press the quality of an object Thus, when I  
say simply, a heart, the word heart is a sub-  
stantive, because none of its qualities are ex-  
pressed, but when I say, a generous heart, the  
word generous is an adjective, because it adds  
a quality, or attribute, to the heart Adjec-  
tives then, appear to be nothing else but mo-  
dificatives In effect, the end of an adjective  
being only to express the quality of an object,  
if that quality be the object itself whereof we  
speak, it becomes a substantive, e. g. if I say,  
this book is good, good here, is in adjective  
but if I say, good is always to be chosen, it is  
evident good is the subject I speak of, and  
consequently, good there, is the substantive  
On the contrary, it often happens in other lan-  
guages, and sometimes in our own, that a sub-  
stantive becomes an adjective, as, for instance,  
in these words the king, hero &c he is re-  
member he is a man, where the word hero,  
though ordinarily a substantive, is yet appar-  
ently in adjective As every quality supposes  
a substance of which it is the quality, it fol-  
lows that every adjective supposes a substan-  
tive If we say the fine touches you, the true  
convinces you, the good is preferable to the  
handsome, the rich relieve you &c it is evident  
that we consider these qualities so far only as they  
are attached to some substance or agent the fine  
that is the substance which is fine, the true, or that  
which is true, &c In these examples, the  
fine the true, &c are not merely adjectives  
they are adjectives used substantively, they  
denote any agent whatsoever, provided that  
agent be fine, true, good &c It therefore  
follows that these words are both adjectives  
and substantives at the same time, they are  
substantives because they denote an agent,  
they are adjectives, because they assign a cer-  
tain qualification to the agent There are as  
many species of adjectives as there are species  
of qualities manners, and relations Qualities  
admit of intensity or remission One apple  
may be sour but another may have more of  
that quality, and hence in some languages a  
distinction is made of comparison, and three  
degrees which sometimes are called the com-  
parative and superlative degrees These de-  
grees are expressed by an addition to the ad-  
jective, in English, as sour, sourer, sourest, or  
by applying the words more and most, as  
more delightful, most delightful, the former  
method being generally used with adjectives of  
one or two syllables the latter when the syl-  
lables are more numerous from these differ-  
ent ways of expressing the same thing in the same  
language, it is evident that the confining of

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tives to two degrees is unnecessary in the philosophy of language, and that it is probable there is some language in which this classification does not take place. This is, in fact, the case in the Hebrew language, to which, of all others, the English approaches nearest in point of simplicity. English grammarians object to the use of double comparatives and superlatives, as improper thus, more higher, most broadest, &c are objectionable. The double superlative most highest, however, is a phrase peculiar to the old vulgar translation of the Psalms, where it acquires a singular propriety from the subject to which it is applied, the Supreme Being, who is indeed far higher than the highest. Adjectives that have in themselves a superlative signification admit not properly the superlative form superaddid thus, chiefest, and extremest, are objectionable. But poetry is in possession of these two improper superlatives, and may be indulged in the use of them. In our language, and indeed in most others, the caprice of custom often gets the better of analogy, and presents us with adjectives that are irregularly compared, as, good, better, best, bad, worse, worst, wiser and lesser, however, must be considered as vulgarisms which probably originated in the habit of terminating comparisons in *et*. Since adjectives express qualities, and therefore cannot be used without the substantives expressed or implied, we may see why participles should frequently be taken for, or seem to pass into the class of, adjectives. "A learned man is never esteemed by a man whose claim to distinction is founded on his wealth or his rank. In this sentence, learned may be considered as an adjective, because from long use the quality only is expressed without reference to time. From having learned, the man is supposed to possess a quality which distinguishes him from others, and this quality is seen when placed in opposition to others who have not had the same advantages. They are called rude, barbarous. Thus we say, "A rude man and a learned man are opposites, where rude is acknowledged at once to be an adjective, and learned is considered of the same class, because it is significant only of the quality without reference to time.

**ADJECTIVELY** *ad* After the manner of an adjective

**ADIEU** *ad* (from a *Dieu*) I farewell (Prior)

**AD INQUIRENDUM**, a judicial writ, commanding inquiry to be made of any thing touching a cause depending in the king's court, for the better execution of justice, as of bastardy, or the like

**To ADJOIN** *v a* (*adjondre*, Fr *adjungo*, Lat) To join to, to unite to, to put to (Watts)

**To ADJOIN** *v n* To be contiguous to (Dryden)

**To ADJOURN** *v a* (*ajourner*, Fr) 1 To put off to another day (Bacon) 2 To put off, to defer (Dryden)

## A D I

**ADJOURNMENT** *s* (*ajournement*, Fr).

1 A putting off till another day (*L'Esrange*)

2 Delay, procrastination (*L'Esrange*)

There is a difference between the adjournment and the prorogation of parliament, the former being done by the house itself, whereas the latter is an act of the king.

**ADIPOCIRL**, formed of *adeps*, fat, and *cera*, wax, a concrete animal oil, lately obtained from the soapy matter into which human bodies are converted after burial. On the opening of the pits (*fosses communes*) in which the corpses of the poor are deposited in the burial ground of the Innocens at Paris, during the years 1786 and 1787, for the purpose of lying out the ground to build upon, the coffins of several were opened, and the bodies examined by Fourcroy and Thouret they were much shrunk, and flattened as if they had been strongly compressed, the linen which covered them adhered firmly, and upon being removed presented to view only irregular masses of a soft ductile greyish-white matter, apparently intermediate between fat and wax, the bones were very brittle. Where the conversion was complete, no trace of muscles, membranes, vessels, tendons, or nerves, was to be found the whole contents of the abdominal cavity were wanting, the heart and other viscera of the thorax were dissolved, the brain, which was not wanting in any, had experienced the same change, but the hair appeared to have undergone no alteration. These conversions were effected in about three years, they are never observed, however, in those bodies that are interred singly, but always take place in the *fosses communes* after which no farther alteration ensues for a long time some of the pits, which had been closed more than forty years, being found to contain little else than a solid mass of soapy matter. From the analyses of this singular substance, it appears to be a true ammoniacal soap, composed of water, ammonia, and a concrete oil, the latter of which, on further investigation, was obtained pure, and is that to which the name adipocire is given. It is, when dry, brittle, combustible, wax, crystallizable, and perfectly insoluble in water. When prepared by mixing well the soapy matter with twelve times its weight of warm water, and decomposing it by a slight excess of acetic or muriatic acid, which is the most effectual way of obtaining it pure, it contains much water between its particles, and is perfectly white. While it retains water, it is soft to the touch, and becomes ductile, like wax, by the warmth of the hand. By drying, it acquires a brownish-grey colour if it be cooled slowly, it assumes a crystalline and lamellar texture, and very much resembles spermaceti. It is soluble in boiling alcohol, in the proportion of an ounce and a half to an ounce of the fluid. Dr Gibbes has obtained adipocire from the matter formed in the receptacle for the bodies which are used for dissection by the anatomical professor at Oxford.

**ADIPOSE MEMBRANE** (*membrana*

## A D J

*adipo-u*, from *adeps*, fat) The fat collected in the cells of the cellular membrane

**ADIPOUS** *a* (*adiposus*, Lat) Fat

**ADIPPE**, in entomology, a species of papilio

**ADIPSIA** (*adipsia*, from  $\alpha$  neg and  $\delta\iota\psi\alpha$ , thirst) A want of thirst A genus of disease in the class locales, and order dysorexia of Cullen's nosology It is always symptomatic of some disease of the sensorium

**ADIRATUS**, a price or value set upon things stolen, as a recompence to the owner

**ADIT**, in general, signifies an approach to, or entrance of, any thing or place, as of a house, a theatre, &c

**ADIT OF A MINE**, the hole, or aperture, whereby it is entered and dug, and by which the water and ores are carried away The term amounts to the same with cuniculus or drift, and is distinguished from air-shaft The adit is usually made on the side of a hill, towards the bottom thereof, about four, five, or six feet high, and eight wide, in form of an arch, sometimes cut in the rock, and sometimes supported with timber, so conducted as that the sole or bottom of the adit may answer to the bottom of the shaft, only somewhat lower, that the water may have a sufficient current to pass away without the use of the pump This term is sometimes used for the air shaft itself, being a hole driven perpendicularly from the surface of the earth into some part of a mine, to give entrance to the air

**ADITION** *a* (*aditum*, Lat) The act of going to another

To **ADJUDGE** *v a* (*adjudico*, Lat) 1 To give the thing controverted to one of the parties by a judicial sentence (*Locke*) 2 To sentence to a punishment (*Shakspeare*) 3 To judge, to decree (*Knolles*)

To **ADJUDICATE** *v a* (*adjudico*, Lat) To adjudge

**ADJUDICATION** *s* (*adjudicatio*, Lat) The act of granting something to a litigant

**ADIVE**, in zoology, an animal of the jackal kind, being the *canis aureus* of Linneus

To **ADJUGATE** *v a* (*adjugio* Lat) To yoke to, to join to another, to yoke

**ADJUMENT** *s* (*adjumentum*, Lat) Help

**ADJUNCT** *s* (*adjunctum* Lat) Something adherent or united to another (*Swift*)

**ADJUNCT** *a* Immediately consequent (*Shakspeare*)

**ADJUNCTION** *s* (*adjunctio*, Lat) 1 The act of adjoining, or coupling together 2 The thing joined

**ADJUNCTS**, in rhetoric and grammar, signify certain words or things added to others, to amplify or augment the force of the discourse

**ADJUNCTIVE** *s* (*adjunctivus* Lat) 1 He that joins 2 That which is joined

**ADJURATION** *s* (*adjuratio*, Lat) 1 The act of proposing an oath to another 2

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The form of oath proposed to another (*Addison*)

To **ADJURE** *v a* (*adjuro*, Lat) To impose in oath upon another, prescribing the form in which he shall swear (*Milton*)

To **ADJUST** *v a* (*ajuster*, Fr) 1 To regulate to put in order (*Swift*) 2 To make accurate (*Locke*) 3 To make conformable (*Addison*)

**ADJUSTMENT** *s* (*ajustement*, Fr) 1 Regulation the act of putting in method, settlement (*Woodward*) 2 The state of being put in method (*Watts*)

**ADJUTAGE** See **ADJUTAGE**

**ADJUTANT** *s* A petty officer, whose duty is to assist the major, by distributing pay, and overseeing punishment In the cavalry, each regiment has an adjutant, in the infantry, each battalion he receives the orders every night from the brigade-major which after carrying them to the colonel, he delivers out to the sergeants

**ADJUTANTS-GENERAL**, among the Jesuits, a number of fathers who resided with the general of the order each of whom had a province or country assigned him, as England, Holland, &c and their business was to inform the father-general of state occurrences in such countries

To **ADJUTE** *v a* (*adjuto*, *adjutum*, Lat) To help, to concur not used (*Jonson*)

**ADJUTOR** *s* (*adjutor*, Lat) A helper

**ADJUTORY** *a* That does help

**ADJUTRIX** *a* She who helps

**ADJUVANT** *a* (*adjuvans*, Lat) Helpful, useful

To **ADJUVATE** *v a* (*adjuvo*, Lat) To help, to further, to put forward

**ADLEGATION**, a right claimed by the states of the German empire of adjoining plenipotentiaries, in public treaties and negotiations, to those of the emperor, for the transacting of matters which relate to the empire in general In this sense adlegation differs from legation, which is the right of sending ambassadors on a person's own account

**ADLOCUTION**, **ADLOCUTIO**, in antiquity, is chiefly understood of speeches made by Roman generals to their armies, to encourage them before a battle

**ADMENSURIMENT** *s* The act or practice of measuring according to rule

**ADMENSUREMENT OF A DECREE** See **DECEP**

**ADMENSUREMENT** **ADMENSURATIO**, in law a writ which lies for the bringing those to reason, or mediocrity, who usurp more of any thing than their share

**ADMENSURATION** *a* (*ad* and *mensura*, Lat) The act of measuring to each his part

**ADMINICUL** *s* (*adminiculum*, Lat) Help support, furtherance

**ADMINICULAR** *a* (from *adminiculum*, Lat) That gives help

**ADMINICULUS**, among antiquaries, or numismatists wherewith Juno is represented on medals

## A D M

**To ADMINISTER** *a* (*administratio*, Lat.) 1 To give, to afford, to supply (*Plutarch*) 2 To act as the minister or agent in any employment or office (*Pope*) 3 To distribute justice 4 To dispense the sacraments (*Hooker*) 5 To tender in oath (*Shakspeare*) 6 To give physic as it is wanted 7 To contribute, to bring supplies (*Speccator*) 8 To perform the office of an administrator

**To ADMINISTERIAL** *a* (*administratio*, Lat.) To give as physic not in use (*Howward*)

**ADMINISTRATION** *s* (*administratio*, Lat.) 1 The act of administering or conducting any employment (*Shakspeare*) 2 The active or executive part of government (*Smyth*) 3 Those to whom the care of publick affairs is committed 4 Distribution, exhibition, dispensation (*Hooker*)

**ADMINISTRATING** *a* (from *administrare*) That does administer

**ADMINISTRATOR** *s* (*administrator*, Lat.) 1 He that has the goods of a man dying intestate committed to his charge (*Cowell*) 2 He that officiates in divine rites (*Watts*) 3 He that conducts the government (*Smyth*)

**ADMINISTRATOR**, in law, he to whom the ordinary commits the administration of the goods of a person deceased, in default of an executor. An action lies for or against an administrator, as for or against an executor, and he shall be accountable to the value of the goods of the deceased, and no further, unless there be waste, or other abuse, chargeable on him. If the administrator die, his executor is not an administrator, but the court is to grant a new administration. If a stranger, who is neither administrator nor executor, take the goods of the deceased, and administer, he shall be charged, and sued as an executor, not as an administrator. The origin of administrators may be traced to the civil law.

**ADMINISTRATORSHIP** *s* (from *administrator*) The office of administrator

**ADMINISTRATRIX**, a female administrator. She who hath good and chatels of an intestate committed to her charge, is administrator

**ADMIRABLE** *a* (*admirabilis*, Lat.) To be admired, of power to excite wonder (*Sidney*)

**ADMIRABILITY**, **ADMIRABLENESS**, **ADMIRABILITY** *s* (from *admirabile*) The quality or state of being admirable

**ADMIRABLY** *ad* (from *admirabile*) In an admirable manner (*Addison*)

**ADMIRAL**, in a general sense, an officer of high naval rank, who usually commands a fleet or squadron of ships of war. Until there were generally three or four admirals appointed in the English seas, all of them holding the office durant beneplacito, and each of them having particular limits under their charge and government as admirals of the fleet of ships, from the mouth of the Thames, northward, southward or westward. Before the word *admiral* was adopted the title of *comes maris* was much use of. Authors are

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divided with regard to the origin and denomination of this important officer, whom we find established in most kingdoms that border on the sea. But the most probable opinion is that of sir Henry Spelman, who thinks, that both the name and dignity were derived from the Saracens, and, by reason of the holy wars, brought amongst us, for admiral, in the Arabian language, signifies a prince, or chief ruler, and was the ordinary title of the governors of cities, provinces, &c. and therefore they called the commander of the navy by that name, as a name of dignity and honour. And indeed there are no instances of admirals in this part of Europe before the year 1284, when Philip of France, who attended St. Louis in the wars against the Saracens created an admiral. Du Cange assures us that the Sicilians were the first, and the Genoese the next, who gave the denomination of admiral to the commanders of their naval armaments, and that they took it from the Saracen or Arabic *amir*, a general name for every commanding officer. As for the exact time when the word was introduced among us, it is uncertain. Some think it was in the reign of Edward I. Sir Henry Spelman is of opinion that it was first used in the reign of Henry III. because neither the laws of Oleron made in 1200 nor Bricton, who wrote about that time, make any mention of it, and that the term admiral was not used in a charter in the eighth of Henry III. wherein he granted this office to Richard de Leece, by these words, *maritimum Angliæ*, but in the fifty-sixth year of the same reign, not only the historians but the charters themselves, very frequently use the word admiral.

**Lord High Admiral of England** in office of so great power and trust, that it has been thought expedient in modern times to place it in the hands of a body of commissioners, who have a kind of president under the title of first lord of the admiralty. Their jurisdiction is exercised over all matters of naval concern whatever.

**Lord High Admiral of Scotland** one of the great officers of the crown, and supreme judge in all maritime cases within that part of Britain.

**ADMIRAL**, also implies the commander in chief of any single fleet or squadron, or in general, any flag officer whatever. The commander of a fleet carries his flag at the main-top-mast head.

**Second Admiral**, is the commander of the second squadron, and carries his flag at the fore-top-mast head.

**Rear Admiral** is the commander of the third squadron, and carries his flag at the mizen-top-mast head.

The rank of an admiral and his station in the line are also indicated by the colour of his flag. Hence there are admirals, vice admirals, and rear admirals, of the white, of the blue, &c.

**ADMIRAL**, is also an appellation given to the most considerable ship of a fleet of merchantmen, or of the vessels employed in the cod fishery of New foundland.

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**ADMIRAL**, in conchology, the name of a beautiful shell of the volute kind, much admired by the curious. There are four species of this shell, viz the grand-admiral the vice-admiral, the orange-admiral, and the extra-admiral. The first is extremely beautiful, of an elegant white enamel, variegated with bands of yellow, which represent in some measure, the colour of the flags in men of war. It is of a very curious shape, and finely turned about the head, the clavicle being exerted, but its distinguishing character is a denticulated line, running along the centre of the large yellow band, by this it is distinguished from the vice-admiral, the head of which is also less elegantly formed. The orange-admiral has more yellow than any of the others, and the bands of the extra-admiral run into one another.

**ADMIRALSHIP** *s* The office of admiral.

**ADMIRALTY**, the office of lord high-admiral, whether discharged by one single person, or by joint commissioners, called lords of the admiralty.

*Court of Admiralty*, a sovereign court, held by the lord high-admiral or lords of the admiralty, where cognizance is taken in all maritime affairs. All crimes committed on the high-seas, or on great rivers below the first bridge next the sea are cognizable in this court only, and before which they must be tried by judge and jury. But in civil cases the mode is different, the decision being all made according to the civil law. In case any person is sued in the admiralty court, contrary to the statutes, he may have the writ of superseas to stop further proceedings and also an action for double damages against the person suing. Subordinate to this court there is another of equity called court-merchant, wherein all causes between merchants are decided, agreeably to the rules of the civil law.

**ADMIRALTY ISLANDS** a cluster of islands in the South Pacific Ocean, to the NW of New Ireland. Some of them appear of considerable extent the centre one lies in about Lat 2 18 S Ion 146 41 E.

**ADMIRATION** *s* Is defined by Mr Grove, to be that sudden surprise it the novelty of an object by which the soul is fastened down to the contemplation of it. He also asserts, that, according to the different character of its object, it is called esteem, or contempt. Indeed much ambiguity attends the precise signification of this word sometimes it is used to denote surprise, at others, wonder, sometimes it is applied to subjects as a mark of degradation, at others, as expressive of excellencies. But in the most pertinent and appropriate use of the terms to admire, and admiration, they are manifestly deviating from a generic to a specific sense, and in proportion, says Dr Cogan, to our advances in precision and accuracy, we feel not only the advantage, but the necessity of applying them to some kind of excellency exclusively, otherwise we shall be destitute of words to discriminate the

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finest feelings of the soul, from those which are common to the most ignorant and uncultivated. Even ideots may be surprised the most ignorant may wonder, and frequently to wonder the most, but neither of them is susceptible of that impression which is best expressed by admiration. If we adhere strictly to the rule, that no two words are perfectly synonymous which cannot be used with equal propriety in every possible connection we shall find that admiration is as superior to surprise and wonder simply considered, as knowledge is superior to ignorance for its appropriate signification is "that act of the mind by which we discover, approve, and enjoy, some unusual species of excellence." Cogan in the Passions, p 147.

**To ADMIRE** *v a* (*admiror*, Lat) 1 To regard with wonder (*Glanville*) 2 To regard with love.

*To ADMIRE* *v n* To wonder (*Reyn*)

**ADMIRER** *s* (from *admirer*) 1 The person that wonders, or regards with admiration (*Latham*) 2 A lover.

**ADMIRINGLY** *ad* (from *admirer*) With admiration (*Shakspeare*)

**ADMISSIBLE** *a* (*admitto*, *admissus*, Lat) That may be admitted (*Hale*)

**ADMISSION** *s* (*admissio* Lat) 1 The act or practice of admitting (*Bacon*) 2 The state of being admitted (*Dryden*) 3 Admission, the power of entering (*Woodward*) 4 The allowance of an argument.

**To ADMIT** *v a* (*admitto*, Lat) 1 To suffer to enter (*Pope*) 2 To suffer access upon an office (*Clarendon*) 3 To allow an argument or position (*Fairfax*) 4 To allow, or grant, in general (*Dryden*)

**ADMITTABLE** *a* (from *admit*) That may be admitted (*Ayliffe*)

**ADMITTANCE** *s* (from *admit*) 1 The act of admitting, permission to enter 2 The power or right of entering (*Locke*) 3 Custom out of use (*Shakspeare*) 4 Concession of a position (*Brown*)

**ADMITTENDO CLERICO**, is a writ granted to him who hath recovered his right of presentation against the bishop in the common pleas.

**ADMITTENDO IN SOCIUM**, is a writ for the association of certain persons to justices of assize formerly appointed.

**To ADMIX** *v a* (*admisceo*, Lat) To mingle with something else.

**ADMIXTION** *s* (from *admix*) The union of one body with another (*Bacon*)

**ADMIXTURE** *s* (from *admix*) The body mingled with another (*Woodward*)

**To ADMONISH** *v a* (*admoneo*, Lat) To warn of a fault, to reprove gently (*Dryden*)

**ADMONISHER** *s* (from *admonish*) The person that puts another in mind of his faults or duty (*Dryden*)

**ADMONISHMENT** *s* (from *admonish*) Admonition, notice of faults or duties (*Shakspeare*)

**ADMONITION** *s* (*admonitio*, Lat)

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The hint of a fault or duty, counsel, gentle reproof (*Hooker*)

**ADMONITION**, in church history, a part of discipline, which consists chiefly in warning an offender of the irregularities he is guilty of and advising him to amend. By the ancient canons, nine admonitions were required before excommunication.

**ADMONITIONER** *s* (from *admonition*.) A general adviser. A ludicrous term (*Hooker*).

**ADMONITORY** *a* (*admonitorius*, Lat.) That does admonish (*Hooker*).

**ADMORTIZATION**, in the feudal customs, the reduction of the property of lands or tenements to mortmain.

**ADMOVE** *v a* (*admoveo*, Lat.) To bring one thing to another.

**ADMURMURATION** *s* The act of murmuring to another.

**ADNATA LUNICA** (*adnata*, from *adnasco*, to grow to) *Albuginea oculi* *Tunica albuginea oculi*. This membrane is mostly confounded with the conjunctiva. It is, however, thus formed: five of the muscles which move the eyes till their origin from the bottom of the orbit, and the sixth arises from the edge of it, they are all inserted by a tendinous expansion into the anterior part of the tunica sclerotica, which expansion gives the whiteness peculiar to the fore part of the eye. It lies between the sclerotica and conjunctiva.

**ADNATA FL.** In botany, adjoined, adhering fastened, fixed or growing to. As the offsets, or small bulbs, produced from the main bulb, and closely adjoining to it, in narcissus, &c. The leaf, adhering to the stem or branch by the surface or dist itself. The petiole. The stipule, fixed to the petiole, and opposed to solute, loose, detached, as in rose, bramble, potentilla, &c. The anther. The style, adhering to the corol, as in cumin.

**ADNOT N.** is used by some grammarians to express what is more usually called an adjective.

**ADO** *s* (from the verb *to do*, with *a* before it, as the French *affaire*, from *a* and *fame*.) 1 Trouble, difficulty (*Sidney*). 2 Bustle, tumult, business (*Locke*). 3 More tumult and show of business than the affair is worth (*I strange*).

**ADOLESCENCE** **ADOLESCENCY** *s* (*adolescencia*, Lat.) The age succeeding childhood, and succeeded by puberty (*Brown*). It is commonly computed to be between fifteen and twenty-five, or even thirty years of age, though in different constitutions its terms are very different. The Romans usually reckoned it from twelve to twenty-five in boys, and to twenty-one in girls, &c. And yet, among their writers, juvenis and adolescens are frequently used indifferently, for any person under forty-five years.

**ADONAI**, one of the names of the Supreme Being in the Scriptures. The Jews, who rather out of respect or superstition, do not pronounce the name of Jehovah, read Adonai, as the name of it, as often as they meet with

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Jehovah in the Hebrew text. But the ancient Jews were not so scrupulous.

**ADONIA**, in antiquity, solemn feasts in honour of Venus, and in memory of her beloved Adonis. The Adonia were observed with great solemnity by most nations, Greeks, Phœnicians, Lycians, Syrians, Egyptians, &c. They lasted two days, and were chiefly celebrated by the women.

**ADONIC**, a sort of verse used by the Greek and Latin poets, consisting of two feet, the first of which is a dactyle, and the second a spondee, or trochee. It was originally used in the lamentations for the death of Adonis, and from that circumstance acquired its name. Its principal use among the poets, however, is only as a conclusion to the Supplic verse, as in the following.

Scandit vitas vitiosa naves  
Cur, nec tumens equitum relinquit  
Ocyor cervis & gente nimibos  
Ocyor Luro

HORAT

**ADONIDS**, in appellation given to such botanists as have given descriptions or catalogues of the plants cultivated in some particular place.

**ADONIS**, son of Cinyris, by his daughter Marthi, was the favourite of Venus. He was fond of hunting, and was often cautioned by his mistress not to hunt wild beasts, for fear of being killed in the attempt. This advice he slighted, and at last received a mortal bite from a wild boar which he had wounded, and Venus, after shedding many tears at his death, changed him into a flower called anemone. Proserpine is said to have restored him to life, on condition that he should spend six months with her, and the rest of the year with Venus. This implies the alternate return of summer and winter. Some writers say, Mars transformed him into a wild boar, and struck Adonis in the groin with his tusk, and thus caused his death.

**ADONIS** (*αδωνις*, from *אדון adon*, Heb.) The herb pheasant-eye so named because it was fabled that Adonis was changed into this flower by Venus, after having been slain by a boar. The Adonis is a genus in the Linnæan class and order polyandria polygynia calyx five-leaved, petals from five to eight, or more, without the numerous pores at the base, seeds naked. It is common to Europe and Africa in several of its species, the whole of which amount to eight. The autumnalis, is the wild pheasant eye of our own corn fields.

**ADONISIS**, a sect or party, among divines and critics, who maintain, that the Hebrew points ordinarily annexed to the consonants of the word Jehovah, are not the natural points belonging to that word, nor express the true pronunciation of it, but are the vowel-points, belonging to the words Adonai and Elohim, applied to the consonants of the ineffable name Jehovah, to warn the readers, that instead of the word Jehovah, which the Jews were forbidden to pronounce, and the true pronunciation

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of which had been long unknown to them, they are always to read Adonai

**TO ADOPT** *v a* (*adopto*, Lat) 1 To take a son by choice, to make him a son, who was not so by birth (*Dryden*) 2 To place any person or thing in a nearer relation to something else (*Locke*)

**ADOPTEDLY** *ad* (from *adopted*) After the manner of something adopted (*Shakspeare*)

**ADOPTIVE** *s* (from *adopt*) He that gives some one by choice the rights of a son

**ADOPTER**, in chemistry, a vessel of a globular form, placed between a retort and a receiver, and serving to increase the length of the neck of the former The adopter has two mouths or apertures opposite to each other, one of which admits the neck of the retort, and the other is received either by the mouth of another adopter, or into the mouth of the receiver

**ADOPTIANA**, in church history, heretics in the eighth century, who held that Jesus Christ is the son of God, not by nature, but by adoption

**ADOPTION**, an act, whereby any person takes another into his family, or as him for his son, and appoints him for his heir The custom of adoption was common among the Romans, yet it was not priestly, but for certain causes expressed in the laws, and with certain formalities usual in such cases they first learnt it from the Greeks This adoption was a sort of imitation of nature, intended for the comfort of those who had no children, therefore he that was to adopt was to have no children of his own, and to be past the age of getting any, nor were councils allowed to begotting children, neither was it lawful for a young man to adopt an elder because that would have been contrary to the order of nature nay, it was even required that he who adopted should be at least eighteen years older than his adopted son, that he might appear a probability of his being the natural father Adoption is also applied to the passion of our Saviour, and the communication of the merits of his death, which being applied to us by baptism, we become the adopted children of God and have a part in the inheritance of heaven This is the doctrine taught by St Paul in several places, particularly in Rom viii 15 Gal iv 45

**ADOPTIVE** *a* (*adoptivus*, Lat) 1 That is adopted by mother (*Bacon*) 2 That does adopt another (*Ayliffe*)

**ADORABLE** *a* (*adorable*, Fr) That ought to be adored, worthy of divine honours (*Cheyne*)

**ADORABLINTSS** *s* (from *adorable*) Worthiness of divine honours

**ADORABLY** *ad* (from *adorable*) In a manner worthy of adoration

**ADORATION**, the act of rendering divine honours, or of addressing God, or a being as supposing it a god. (See **WORSHIP**) The word is compounded of *ad*, to and *os*, mouth,

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and literally signifies to apply the hands to the mouth, *manum ad os olmoine*, q d to kiss the hand, this being, in the eastern countries, one of the great marks of respect and submission The Romans practised adoration at sacrifices and other solemnities, in passing by temples, altars, groves, &c, at the sight of statues, images, or the like, whether of stone or wood, wherein any thing of divinity was supposed to reside Usually there were images of the gods placed at the gates of cities, for those who went in or out, to pay their respects to The ceremony of adoration among the ancient Romans was thus The devotee having his head covered, applied his right hand to his lips, the fore finger resting on his thumb, which was erect, and thus bowing his head, turned himself round from left to right The Jewish manner of adoration was by prostration, bowing and kneeling The Christians adopted the Grecian rather than the Roman method, and adored always uncovered The ordinary posture of the ancient Christians was kneeling, but on Sundays standing, and they had a peculiar regard to the East, to which point they ordinarily directed their prayers

**ADORATION** is more particularly used for the act of performing our requests or thanksgivings to Almighty God It is also used for certain extraordinary civil honours or respects which resemble those paid to the deity, yet are given to men The practice of adoration, though highly unbecoming in one human being, towards another, is still subsisting in England in the ceremony of kissing the king's or queen's hand and in serving them at table, both being performed kneeling

**ADORATION** is more particularly used for kissing one's hand in presence of another, as a token of reverence The Jews adored by kissing their hands and bowing down their heads, whence, in their language, kissing is properly used for adoration

**ADORATION** is also used, in the court of Rome, for the ceremony of kissing the pope's feet It is said of Dioclesian, that he had gums fastened to his shoes that divine honours might be more willingly paid him, by kissing his feet The like usage was afterwards adopted by the popes, who finding a vehement disposition in the people to fall down before them and kiss their feet, had crucifixes fastened on their slippers, by which the adoration intended for the pope's person is supposed to be transferred to Christ

**ADORATION**, *perpetual* is a kind of society or association of devout persons established in Romish countries, who take their turns to pray before the eucharist, regularly relieving each other, so that the service never ceases day nor night

**TO ADORF** *v a* (*adoro*, Lat) To worship with external homage (*Dryden*)

**ADORER** *s* (from *adore*) He that adores, a worshipper (*Prior*)

**TO ADORN** *v a* (*adorno*, Lat) 1 To dress, to deck the person with ornaments (*Cowley*) 2 To set out any place or thing



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with decorations (*Chwaley*) 3 To embellish with oratory (*Sprat*)

**ADORNMENT**, (from *adorn*) Ornament, embellishment not in use (*Raleigh*)

**ADOUR**, a river of France which rises in the mountains of Bigorre, and falls into the bay of Biscay

**ADOWN** *ad* (from *a* and *down*) Down, on the ground (*Spenser*)

**ADOWN** *prep* Toward the ground

**ADOXA** *Tuberosa moschatell*, or hollow-root A genus of the Linnæan class and order octandria tetragynia thus characterised calyx two or three cleft, hull inferior corol four or five cleft, superior capsule four or five celled, invested with the calyx One species only is known, which is common to the woods of our own country

**ADPONDUS OMNIUM** The weight of the whole The words are inserted in pharmaceutical preparations or prescriptions when the last ingredient ought to weigh as much as all the others put together

**ADPRESSUS**, in botany denotes contiguous, pressed to, or laid to

**ADQUISTA** See *PROSIAMBANOMINOS*

**AD QUOD DAMNUM**, writ directed to the sheriff, commanding him to inquire what hurt may befall the king by granting a fur, or market, in any town, or place The same writ also issues for an inquiry to be made of what the king, or other person, may suffer, by granting lands in fee simple to a convent, chapter, or other body politic, by reason such land falls into mortmain

**ADRACANTHUS**, or **ADRACANTHUM** See *TRAGACANTH*

**ADRIMMELICH**, one of the gods of the inhabitants of Sepharvaim, who were settled in the country of Samaria, in the room of those Israelites who were carried beyond the Euphrates The Sepharvites made their children pass through fire, in honour of this idol and another called Anamelmeh It is supposed, that Adrimelmeh meant the sun, and Anamelmeh the moon the first signifies the magnificent king, the second the gentle king

**ADRAMIPIUM** a famous city of Mysia Major, called also Pedasus which, according to Strabo, was in Athenian colony with a harbour and dock, situated at the foot of mount Ida, near the Cicutæ It was so called from Adramitus, the brother of Cræsus, by whom it was built

**ADRASTIA**, in antiquity, an epithet given to the goddess Nemesis, or Revenge

**ADRASTIA CIRIAMIÑA**, a kind of Pythian games instituted at Sicyon, in honour of Apollo

**ADRASTIA**, in Troas, Asia, so called from Adrastus, who built it it was famous for the temple of Nemesis and the oracle of Apollo Lat 39 40 N Lon 28 30 E

**ADRASTIA**, a daughter of Jupiter and Nemesis She is called by some Nemesis, and is the punisher of injustice The Egyptians

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placed her above the moon, whence she looked down upon the actions of men

**ADRASTUS**, king of Argos, son of Talpius and Iysianassa, daughter of Polybius, king of Sicyon, acquired great honour in the famous war of Thebes, in support of Polynæus his son-in-law, who had been excluded the sovereignty of Thebes by Eteocles his brother, notwithstanding their reciprocal agreement Adrastus, followed by Polynæus and Tydeus, his other son-in-law, by Capaneus and Hippomedon his sisters sons, by Amphiarus his brother-in-law and by Parthenopæus, marched against the city of Thebes, and this is the expedition of the Seven Worthies, which the poets have so often sung They all lost their lives in this war, except Adrastus, who was saved by his horse called Arion This war was revived ten years after by the sons of those deceased warriors, which was called the war of the Epigones, and ended with the taking of Thebes None of them lost their lives, except Ægialeus son of Adrastus, which afflicted him so much, that he died of grief in Megara, as he was leading back his victorious army

**ADRIAD** *ad* (from *a* and *drad*) In a state of fear obsolete (*Spenser*)

**ADRIAN**, the sixteenth emperor of Rome, is represented as a learned, warlike, and austere general He came to Britain where he built a wall between the modern towns of Carlisle and Newcastle, 60 miles long, to protect the Britons from the incursions of the Chædonians He killed in battle 500,000 Jews who had rebelled, and built a city on the ruins of Jerusalem which was called Æliæ His memory was so retentive that he remembered every incident of his life and knew all the soldiers of his army by name In the beginning of his reign, he followed the virtues of his adopted father and predecessor Trajan he remitted all arrears due to his treasury for sixteen years, and publicly burnt the account books, that his word might not be suspected It is said that he wished to enrol Christ among the gods of Rome, but his apparent lenity towards the Christians was disproved, by the erection of a statue to Jupiter on the spot where Jesus rose from the dead, and one to Venus on mount Calvary He died of a dysentery at Baie, A D 138, in the 63d year of his age, after a reign of 21 years On his death-bed he composed some Latin verses, addressed to his soul, which bear the uncertainty he was in with regard to a future state and present a striking contrast to the tranquil confidence of Adrius

Animula, vagula blandula,  
Hospes, comesque corporis,  
Quæ nunc abibis in loca,  
Pallidula, rigida, nudula?  
Nec, ut soles, dabis jocos

Thus beautifully imitated by Prior

Poor little, pretty fluttering thing,  
Must we no longer live together?

And dost thou prune thy trembling wing  
To take thy flight, thou know'st not  
whither?

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Thy humorous vein, thy pleasing folly,  
Lies all neglected, all forgot  
And pensive, wiv'ring, melancholy,  
Thou dread'st and hop'st, thou know'st  
not what

The translation of Pope is as follows

Ah! fleeting spirit! wand'ring fire,  
That long has warm'd my tender breast,  
Must thou no more this frame inspire?  
No more a pleasing cheerful guest!  
Whither, ah, whither art thou flying?  
To what dark undiscover'd shore?  
Thou seem'st all trembling, shivering,  
dying,

And wit and humour are no more!

**ADRIAN IV** (Pope,) the only Englishman in who ever had that dignity, was born at Langley, near St Albans. His name was Nicholas Brekespere and he was some time at the monastery of St Albans in a low condition. Being refused the habit in that house, he went to France, and became a clerk in the monastery of St Rufus, in Provence of which he was afterwards chosen abbot, but the monks not liking his government, complained of him to pope Eugenius III who was so pleased with him, that he took him under his patronage, and made him cardinal bishop of Alba in 1146. In 1148, that pope sent him legate to Denmark and Norway, which nations he converted to the Christian faith. In 1154, he was chosen pope, and took the name of Adrian, on which, Henry II king of England, sent the abbot of St Albans with three bishops to congratulate him. The pope disregarding the slight formerly put upon him, granted considerable privileges to the monastery of St Albans, and a bull to Henry for the conquest of Ireland. In 1155, he excommunicated William, king of Sicily, for ravaging the territories of the church and about the same time, the emperor Frederic meeting the pope near Sutrin, held his stirrup while he mounted on horseback, after which his holiness conducted him to Rome and consecrated him king of the Romans, in St Peter's church. The next year the king of Sicily submitted and was absolved. Adrian, by his active conduct, left the papal territory in a better state than he found it, and died, not without suspicion of poison, September 1, 1159 and was buried in St Peter's church near his predecessor Eugenius (*Watkins's Dict*).

**ADRIANISTS**, in ecclesiastical history a sect of heretics, divided into two branches. The first were disciples of Simon Magus, and flourished about the year 34. The second were the followers of Adrian Hamstead, the baptist, and held some particular errors concerning Christ.

**ADRIANOPLE**, a large city of Turkey in Europe, in the province of Romanum. It is the see of an archbishop. It has been called Arestes, Orestias, and Uscudama; its present name was given it by the emperor Adrian, who repaired it in the year 122. Lat 41 42 N Long 26 31 E

**ADRIATIC SEA**, a gulf of the Mediterranean

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near Sea, between Greece and Italy extending from Lat 40 to 45 55 N. There are many islands in it, and many bays on each coast. It is often called the Gulf of Venice.

**ADRIET** *ad* Floating at random

**ADROGATION**, in antiquity, a species of adoption, whereby a person who was capable of choosing for himself, was admitted by another into the relation of a son.

**ADROIT** *a* (French) Dexterous, active, skilful (*Jervas*).

**ADROITNESS** *s* (from *adroit*) Dexterity, readiness, activity.

**ADRY** *ad* (from *a* and *dry*) Athirst, thirsty.

**ADSCITITIOUS** *a* (*ascitus*, Lat) That is taken in to complete something, additional.

**ADSLIATION** (*adcellatio*, from *ad-sello*, to go to stool) The act of evacuating the abdominal faeces.

**ADSIDILIA**, in antiquity, the table at which the flames sat during the sacrifice.

**ADSTRICTION** *s* (*adstrictio*, Lat) The act of binding together.

**ADSTRINGENTS** (*adstringentia*, *nucumcamela* from *ad*, and *stringo*, to bind) Astringents. In medicine, those substances which possess a power of condensing the mucous fibre. To the taste they impart a sense of dryness, and a remarkable corrugation in the parts on which they immediately act.

**AD TERMINUM QUI PRATERIT** in law, a writ of entry which lies for the lessor or his heirs, if after the expiration of a lease, whether it be for years or life, the lessee, or other occupier of the land, &c refuses to quit the premises.

**ADUACA** (Antonine), or **ATUACA**, contracted from *Atuacum* (Celtic), anciently a large and famous city of the Tungri, now a small and inconsiderable village, called Tongeren, in the bishopric of Liege, to the north-west of the city of Liege in the territory of Haspengow, on the rivulet Jecker, that soon afterwards falls into the Meuse. Long 5 22. Lat 50 34.

*To ADVANCE* *v a* (*avancer*, Fr) 1 To bring forward, in the local sense (*Parry*) 2 To rise to preferment, to aggrandize (*Estlin*) 3 To improve (*Tillotson*) 4 To heighten, to grace (*South*) 5 To forward, to accelerate (*Bacon*) 6 To propose, to offer to the publick (*Dryden*)

*To ADVANCE* *v n* 1 To come forward (*Parrel*) 2 To make improvement (*Locke*)

**ADVANCE** *s* (from the verb) 1 The act of coming forward (*Clarendon*) 2 A tendency to come forward to meet a lover, an act of invitation (*Walsh*) 3 Gradual progression, rise from one point to another (*Attobury*) 4 Improvement, progress toward perfection (*Hale*) 5 Money paid before goods are delivered, or work done.

**ADVANCED DITCH**, or moat, in fortification is that drawn round the glacis or esplanade of a place.

**ADVANCED-GUARD**, or **VANGUARD**, in the art of war, denotes the first line of division.

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of an army, ranged or marching in order of battle, or it is that part which is next the enemy, and marches first towards them

**ADVANCED-GUARD** is more particularly used for a small party of horse stationed before the main-guard

**ADVANCEMENT** *a* (from *avancement*, Fr)

1 The act of coming forward (*Suift*) 2 The state of being advanced, preferment (*Shakspeare*) 3 The act of advancing another (*Shakspeare*) 4 Improvement (*Brown*)

**ADVANCER** *s* (from *advance*) A promoter, a forwarder (*Bacon*)

**ADVANTAGE** *s* (a *antage* Fr) 1 Superiority (*Spial*) 2 Superiority gained by stratagem (*Spenser*) 3 Opportunity, convenience (*Shakspeare*) 4 Favourable circumstance (*Haller*) 5 Gain, profit (*Iol*) 6 Overplus, something more than the mere lawful gain (*Shakspeare*) 7 Preponderation on one side of the comparison

To **ADVANTAGE** *v a* (from the noun) 1 To benefit (*Locke*) 2 To promote to bring forward (*Glanville*)

**ADVANTAGEABLE** *a* (from *advantage*) Profitable, convenient, lawful (*Hayward*)

**ADVANTAGED** *a* (from the verb) Possessed of advantages (*Glanville*)

**ADVANTAGE GROUND** *s* Ground that gives superiority and opportunities of annoyance or resistance (*Clarendon*)

**ADVANTAGEOUS** *a* (*avantageux*, Fr) Profitable, useful, opportune (*Hammond*)

**ADVANTAGEOUSLY** *ad* (from *advantageous*) Conveniently, opportunely, profitably (*Arbutnot*)

**ADVANTAGEOUSNESS** *s* (from *advantageous*) Profitableness, usefulness, convenience (*Boyle*)

**ADVAR** *n* the Arabian and Moorish custom, a kind of ambulatory village, consisting of tents which these people remove from one place to another

To **ADVANCE** *v n* (*advenco* Lat) To accede to something, to be superadded (*Ayliffe*)

**ADVANCEMENT** *a* (*advencus*, Lat) Advancing, superadded (*Glanville*)

**ADVENT**, **ADVENTUS**, in the calendar the time immediately preceding Christmas, and was anciently employed in preparation for the adventus, or coming on of the feast of the Nativity. Advent includes four Sundays, or weeks, commencing either with the Sunday which falls on St Andrew's day, namely the 30th day of November, or the nearest Sunday to that day, either before or after

**ADVENTINE** *a* (from *adventus*, Lat) Adventitious, that which is extrinsically added. Not in use (*Bacon*)

**ADVENTITIAL** *a* **ADVENTITIAL**, in antiquity, an entertainment made to welcome a person on his return from a journey

**ADVENTITIOUS** *a* (*adventitious* Lat) That does advent, accidental, supervenient, extrinsically added (*Bayl Dryden*)

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**ADVENTIVE** *s* (from *advento*, Lat) The thing, or person that comes from without not in use (*Bacon*)

**AD VINI RUM INSPICIENDUM**, in law, a writ commanding a woman to be searched, whether she be with child by a former husband, on her withholding of lands from the next feuing issue of her own body. It is also ordered when a woman pleads pregnancy against the execution of the sentence of death

**ADVENTUAL** *a* (from *advent*) Relating to the season of advent (*Bishop Saunders*)

**ADVENTURE** *s* (French) 1 An accident, a chance, a hazard (*Hayward*) 2 An enterprise in which something must be left to hazard (*Dryden*)

**ADVENTURE** Bill of a writing testifying the goods mentioned in it to be shipped on board a certain vessel belonging to another person, who is to run all hazards

**ADVENTURE ISLAND**, a small island in the Pacific ocean it is situated according to the requisite tables nearly in lat 17 5 S Long 114 18 W

To **ADVENTURE** *v n* (*aventurer*, Fr) 1 To try the chance, to dare (*Shakspeare*) 2 In an active sense, to put into the power of chance (*Judges*)

**ADVENTURER** *s* (*aventurier*, Fr) He that seeks occasions of hazard, he that puts himself into the hands of chance (*Spenser*)

**ADVENTURERS**, in ancient company of merchants and traders, created for the discovery of lands, trades, &c unknown

**ADVENTURISOME** *a* (from *adventure*) The same with **ADVENTUROUS** A low word

**ADVENTURISOMENESS** *s* (from *adventure*) The quality of being adventurous

**ADVENTUROUS** *a* (*aventureux*, Fr) 1 Inclined to adventures bold, daring, courageous (*Dryden*) 2 Full of hazard, dangerous (*Addison*)

**ADVENTUROUSLY** *ad* (from *adventurous*) Boldly, daringly (*Shakspeare*)

**ADVERB** *s* (*adverbium*, Lat) A word joined to a verb or adjective, and solely applied to the use of qualifying and restraining the latitude of their signification (*Clarke*) Not that the adverb is confined purely to the verbs, but because that is its most ordinary use. Whence it becomes so denominated *adv* *verbum*. We frequently find it joined to adjectives, and sometimes even to substantives, particularly where those substantives signify an attribute, or quality of the thing spoken of, as *gr* he is very sick, he is truly king. An adverb is likewise joined sometimes to another adverb to modify its meaning, as *gr* very devoutly, &c. Whence some grammarians choose rather to call adverbs modificatives, comprising under this one general term, adverbs conjunctions, prepositions, and even adjectives. Adverbs are very numerous but they may be reduced under the general classes of adverbs of

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time, of place, of order, of quantity, of quality, of manner, of interrogation, of affirmation, of denegation, of diminution, of doubting, of exception, and of comparison. We cannot help considering it as unfortunate, however, that in all languages a number of words is placed in the class of adverbs, which strike the observer, at first sight, to be compound words. Thus, notwithstanding, in the English, *dependant*, in the French, *are* evidently compounds. While *is* a substantive, meaning time, *is* of the Greeks. Wisely is a compound of two adjectives, and we may say "he speaks wisely, or "he speaks like a wise man" indifferently, the use of the adverb is it is called giving concreteness only to the expression. This class of words was formed from the ignorance of the parts in every compound, thus if instead of like a wise man, we translate the phrase into Latin, and use the word *sapienter* this adjective is immediately changed as an adverb, or something distinct from the adjective or verb, yet the *er* is probably the same force with the *ly* in English. We may modify the quality expressed by a verb or a noun various ways. A high mountain may be called "an exceedingly high mountain, where exceedingly is applied to high, high like exceeding, much, most mountains we know. He suffers patiently, namely, like a patient man. "While the country was alarmed, &c. While is called an adverb but it is a substantive, and we frequently say, "all the while, &c. "all the time while, therefore, means during the time. Really is like real men, and is in opposition to pretended. Hence, then, wherever this class is admitted, the student should endeavour to learn the force of the word, not by fruitless modifications of verbs and adjectives in a variety of senses, but by learning the real meaning of the word.

**ADVERBIUM** *a* (*adverbialis*, Lat.) That has the quality or structure of an adverb.

**ADVERBIALITY** *ad* (*adverbialis*, Lat.) In the manner of an adverb (*Addison*).

**ADVERSARI** *a* (from *adverse*) Contrary to opposite to.

**ADVERSARIA**, among the ancients, a book of accounts, somewhat like our journals or daybooks.

**ADVERSARIA**, is also a title given to divers books containing collection of miscellaneous remarks, &c.

**ADVERSARIA**, is likewise used for a commentary on some text or writing.

**ADVERSARY** *s* (*adversarius*, Fr. *adversarius*, Lat.) An opponent, antagonist, enemy (*Shakspeare*).

**ADVERSATIVE** *a* (*adversativus*, Lat.) A word which makes some opposition or variety. Thus in the phrase, he is a clever fellow, but a great rascal, the word *but* is in adversative conjunction. Mr. H. Locke has shown, in his *ENQUIRY*, that there are two senses to the word *but*, in the first it is a corruption of *bot*, the imperative of the Greek verb *botan*, to boot, superadd or supply, and in the second, it is a continuation of the utan to be

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out, in illustration of this theory is given the following couplet

"But thy work shall endure in laud and  
glorie,

But spot or faulte condigne eterne memorie  
The meaning is "superadd (to something said before) thy work shall endure in laud and glorie be out or without spot or faulte.

**ADVERSARIOR**, in antiquity, a servant who attended the rich in returning from supper, to give them notice of any obstacles in the way, at which they might be apt to stumble.

**ADVERSUS** *a* (*adversus*, Lat.) 1 Acting with contrary directions (*Milton*). 2 Adversus, afflictive, pernicious opposed to prosperous (*Roscommon*). 3 Personally opponent (*Sudury*).

**ADVERSUS** *ad* (from *adverse*) Oppositely unfortunately (*Shakspeare*).

**ADVERSITY** *s* (*adversitas*, Fr.) 1 Affliction, calamity, the cause of sorrow, misfortune (*Shakspeare*). 2 The state of unhappiness, misery (*Shakspeare*).

*Adversus* *in* (*adversus*, Lat.) To tend to, to recur, to observe (*Ray*).

**ADVERTENCE** *s* (from *advert*) Attention, recollection, heedfulness (*Decay of Poetry*).

*Advertent* *a* (*advertent*, Lat.) 1 To inform another, to give intelligence. 2 To give notice of any thing in the publick prints.

**ADVERTISEMENTS**, or **ADVERTISEMENTS** *s* (*avertissement*, Fr.) 1 Instruction, admonition (*Shakspeare*). 2 Intelligence, information (*Holder*). 3 Notice of any thing published in a paper of intelligence. By the statute law the penalty of 50*l* is inflicted on person advertising a reward with "no questions to be asked for the return of things lost or stolen. The same penalty attaches to the printer.

**ADVERTISER** *s* (*avertisseur*, Fr.) 1 He that gives intelligence or information. 2 That paper in which advertisements are published.

**ADVERTISING** *a* (from *advertise*) Active in giving intelligence, monitory (*Shakspeare*).

*Adversus* *in* (*adversus*, Lat.) To draw toward evenness.

**ADVICE** *s* (*avis*, *advis*, Fr.) 1 Council, instruction (*Prior*). 2 Reflection, prudent consideration (*Shakspeare*). 3 Consultation, deliberation (*Bacon*). 4 Intelligence.

**ADVICE BOAT** *s* A vessel employed to bring intelligence.

*Letter of Advice* in commerce implies a letter sent by the drawer of a bill of exchange, or the remitter of goods, &c. to his correspondent informing him that he has drawn such a bill or sent such a quantity of merchandize, by such a ship, or other conveyance.

**ADVISABLE** *a* (from *advise*) Prudent, fit to be advised (*South*).

**ADVISABILITY** *s* (from *advisable*) The quality of being advisable, fitness, propriety.

*Adviser* *v* *a* (*avisier*, Fr.) 1 To

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counsel (*Shakspeare*) 2 To inform to make acquainted

To ADVISE *v n* 1 To consult 2 To consider, to deliberate (*Milton*)

ADVISED *particip a* (from *advise*) 1 Acting with deliberation and design, prudent, wise (*Bacon*) 2 Performed with deliberation, acted with design (*Hooker*)

ADVISEDLY *ad* (from *advised*) Deliberately, purposely, by design, prudently (*Sue*)

ADVISEDNESS (from *advised*) Deliberation, cool and prudent procedure (*Saunders*)

ADVISEMENT *s* (*aviseмент*, Fr) 1 Counsel, information (*Spenser*) 2 Prudence, circumspection

ADVISER *s* (from *advise*) The person that advises a counsellor (*Hallen*)

ADULATION *s* (*adulation*, Fr *adulation*, Lat) Flattery, high compliment (*Cicero*)

ADULATOR *s* (*adulator*, It) A flatterer

ADULATORY *a* (*adulatorius*, Lat) Flattering, full of compliments

ADULT *a* (*adultus*, It) Grown up past the age of infancy (*Bla knoe*)

ADULT *s* A person above the age of infancy, or grown to some degree of strength (*Shu p*)

To ADULTER *a* (*adultatus*, Fr) To commit adultery with another (*Johnson*)

ADULTERANI *s* (*adultatus*, Lat) The person or thing which adulterate

To ADULTERATE *a* (*adultatus*, Fr) 1 To commit adultery (*Shakspeare*) 2 To corrupt by some foreign admixture (*Boyl*)

ADULTERATE *a* (from the verb) 1 Tainted with the guilt of adultery (*Shakspeare*) 2 Corrupted with some foreign mixture (*Swift*)

ADULTERATENESS *s* (from *adulterate*) The quality or state of being adulterate

ADULTERATION (from *adulterare*, to corrupt) Is the corruption, or debasement, by an improper mixture, of any substance that was originally a pure one. This art, though not unknown to the ancients, but in modern times been carried to a great extent, inasmuch that the rules and principles upon which so pernicious a practice is founded, are often considered as qualifications essential to those persons who supply others with the necessities, as well as the luxuries, of life. We are, indeed, provided with excellent laws against adulterations, but opportunities are too frequently taken either of eluding the vigilance and severity of justice, or of concealing the delinquent practice in so skilful a manner, as to render detection extremely difficult, and sometimes impossible. We shall present to our readers the best method known of detecting adulteration, under the several which relate to the various substances liable to it, as ACIDS, BEER, BREAD, COFFEE, HONEY, OIL, SEEDS, TEA, TOBACCO, VINEGAR, WAX, WINE, &c.

&c. See also L. S. POOR, &c.

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ADULTERATION OF COIN, is effected diversely, as, by making use of a strong or baser metal, or an undue alloy, &c. To adulterate or debase the current coin, is a capital crime in all civilised nations

ADULTERATION (*adulteratio*) In pharmacy, the substitution of base or counterfeit medicines for such as are genuine

ADULTERER *s* (*adulter*, Lat) The person guilty of adultery (*Dryden*)

ADULTRESS *s* (from *adulterer*) A woman that commits adultery

ADULTERINE *s* (*adulterine*, Fr) A child born of an adulteress

ADULTEROUS *a* (*adulterinus*, Lat) Guilty of adultery (*Taylor*)

ADULTERY *s* (*adulterium*, Lat) The act of violating the bed of a married person (*Dryden*)

In many countries this crime has been capital in others venial and attended only with slight pecuniary mulcts

Some of the penalties are serious, and even cruel, others of a humorous kind. Even contrary things have been enacted as punishments for adultery

By some laws the criminals are forbid marrying together in case they became single, by others they are forbid to marry any besides each other, by some, they are incapacitated from ever committing the same crime again, by others they are glutted till it becomes nauseous to themselves, as in the reign of Theodosius

Among the rich Greeks, adulterers were allowed to redeem them selves by a pecuniary fine, the woman's father, in such cases, returned the dowry he had received from her husband, which some think is refunded by the adulteress

Another punishment among those people was, putting out the eyes of adulterers

The Athenians had an extraordinary way of punishing adulterers, called *τρωαλισμός*

practised at least on the poorer sort who were not able to pay the fines

This was an awkward sort of empalement performed by thrusting one of the largest radishes up the anus of the adulterer, or, in defect thereof, a fish with a large head, called mullet

Alceus is said to have died this way though it was doubted whether the punishment was reputed mortal

Juvenal and Catullus speak of this custom, as received also among the Romans, though not authorized by an express law, it was among the Greeks

Among the Romans, we are told, that the wife father was allowed to kill both parties, committing adulterers, when caught in the fact, provided he did it immediately, killing both together, and as it were with one blow

The same power ordinarily was not indulged to the husband except the crime were committed with some mean or infamous person, though, in other cases, if his rage carried him to put them to death, he was not punished as a murderer

On many occasions, however, revenge was not carried so far but mutilating, castrating, cutting off the ears, nose, &c. served the turn

The punishment allotted by the lex Julia was not, as many have imagined, death, but rather banishment, or deportation, being

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interdicted fire and water though Octavius appears, in several instances, to have gone beyond his own law, and to have put adulterers to death Under Macrinus, many were burnt at a stake Constantine first by law made the crime capital Under Constantius and Constant, adulterers were burnt, or sewed in sacks and thrown into the sea Under Leo and Marcian, the penalty was abated to perpetual banishment, or cutting off the nose Under Justinian, a further mitigation was granted, at least in favour of the wife, who was only to be scourged, lose her dower, and be shut up in a monastery after two years, the husband was at liberty to take her back again, if he refused, she was shaven, and made a nun for life, but it still remained death in the husband The reason alleged for this difference is that the woman is the weaker vessel Mathæus declaims against the empress Theodora who is supposed to have been the cause of this law, as well as of others procured in favour of the sex from that emperor Under Theodosius, women convicted of this crime were punished after a very singular manner, viz by a public contumacious, being locked up in a narrow cell, and forced to admit to their embraces all the men that would offer them selves To this end, the gillants were to dress themselves on purpose, having several little bells fastened to their clothes, the tinkling of which gave notice to those without of every motion This custom was again abolished by the same prince To the scandal of Britain, adultery is a growing crime, notwithstanding the heavy pecuniary damages given in our courts of justice, in many cases It is reckoned a spiritual offence, that is, cognizable by the spiritual courts The common law takes no further notice of it than to allow the party grieved an action and damages By the Jewish law, adultery was punished with death in both parties, where they were both married or only the woman The Jews had a particular method of trying, or rather purging, in adulteresses, or a woman suspected of the crime, by making her drink the bitter waters of jealousy which, if she were guilty, made her swell It is much disputed whether adultery dissolves the bond of matrimony and be a sufficient cause of divorce so that the parties may marry again This was allowed in the ancient church and is still continued in the Greek as well as the Lutheran and Calvinist churches Roman is however, disallow of it and the council of Trent even mathematized those who marry again The ecclesiastical courts in England so far agree with the Papists, that they only grant a divorce a mensa et thoro, in case of adultery, so that a complete divorce, to enable the parties to marry again, cannot be had without an act of parliament

**ADULTERY** is sometimes used in a more extensive sense, for any species of impurity or crime, against the virtue of chastity, and in this sense divines understand the seventh commandment

**ADULTERY** is also used, especially in

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Scripture, for idolatry, or departing from the true God, to the worship of a false one

**ADULTERY** is used, in ecclesiastical writers, for a person's invading, or intruding into a bishopric, during the former bishop's life The reason of the appellation is, that a bishop is supposed to contract a kind of spiritual marriage with his church The translation of a bishop from one see to another was also reputed a species of adultery, on the supposition of its being a kind of second marriage, which, in those days, was esteemed a degree of adultery This conclusion was founded on that text of St Paul, Let a bishop be the husband of one wife, by a forced construction of church for wife, and of bishop for husband

**ADULTINESS** *s* (from *adult*) The state of being adult

**ADUMBRANT** *a* (from *adumbrate*) That gives a slight resemblance

**TO ADUMBRATE** *v a* (*adumbrare*, Lat) To shadow out, to give a slight likeness, to exhibit a faint resemblance (*Decay of Piety*)

**ADUMBRATION** *s* (from *adumbrate*) 1 The act of giving a slight and imperfect representation (*Bacon*) 2 A faint sketch (*Hale*)

**ADUNATION** *s* (from *ad* and *unio* Lat) The state of being united, union (*Boyle*)

**ADUNCITY** *s* (*aduncitas*, Lat) Crookedness, hookedness (*Asluthnot*)

**ADUNQUE** *a* (*aduncus*, Lat) Crooked, bending inward, hooked (*Bacon*)

**ADVOCACY** *s* (from *advocate*) Vindication, defence, apology (*Brown*)

**ADVOCARIA** in the middle ages, a tax paid the lord for his protection

**ADVOCATE** *s* (*advocatus*, Lat) 1 He that pleads the cause of another in a court of judicature (*Ayl Dryd*) 2 He that pleads any cause in whatever manner, as a controversialist or vindicator (*Shakspeare*) 3 In the sacred sense, one of the offices of our Redeemer (*Hilton*)

**ADVOCATE**, among the Romans, a person killed in their law, who undertook the defence of causes at the bar The Roman advocates answered to one part of the office of a barrister in England, viz the pleading part, for they never gave counsel, that being the business of the juriconsulti

**ADVOCATE OF A CITY**, in the German policy, an appellation given to a magistrate appointed in the emperor's name to administer justice

**ADVOCATE** is more particularly used in church history, for a person appointed to defend the rights and revenues of a church or religious house The word advocatus, or advocate is still retained for what we usually call the patron or he who has the advowson, or right of presentation in his own name

*Consistorial Advocates*, officers of the consistory at Rome who plead in all oppositions to the disposal of benefices in that court they are ten in number

*Elective Advocates*, those chosen by the abbot, bishop, or chapter, a particular licence

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being had from the king or prince for that purpose

**Feudal Advocates** These were of the military kind, who were to lead the vassals of the church to war, not only in private quarrels of the church itself but in military expeditions for the king's service, in which they were the standard-bearers of their churches.

**Fiscal Advocate**, *fiscal advocatus*, in Roman antiquity, an officer of state under the Roman emperors, who pleaded in all causes wherein the fiscus, or private treasury, was concerned.

**Juridical Advocates**, in the middle ages, those who from attending causes in the court of the count of the province, became judges themselves, and held courts of their vassals thrice a year, under the name of the *trial placita generalia*.

**Matricular Advocates**, were the advocates of the mother or cathedral church.

**Military Advocates** were introduced in the times of confusion when every person was obliged to maintain his property by force, bishops and abbots not being permitted to bear arms, recourse was had to knights, noblemen, soldiers, or even to princes.

**Regular Advocates** those duly formed and qualified for their profession by a proper course of study, the requisite oath, subscription, licence, &c.

**Subordinate Advocates**, those appointed by other superior ones, acting under them, and accountable to them.

**Supreme or Sovereign Advocates**, were those who had the authority in chief, but acted by deputies or subordinate advocates. These were called also principal, greater, and sometimes general advocates. Such in many cases were kings, &c. when either they had been chosen advocates, or became such by being founders or endowers of churches.

**Faculty of Advocates**, in Scotland a respectable body of lawyers, in number above 400 who plead in all causes before the courts of session, justiciary, and exchequer. They are also introduced to plead in the house of peers, and other supreme courts in England.

**Lord Advocate or King's Advocate** one of the chief great officers of state in Scotland who is such sit in parliament without election. He is the principal crown lawyer in Scotland. His business is to act as a public prosecutor and to plead in all causes that concern the crown.

**ADVOCATION** *s* (from *advocate*) The office of pleading, plea, apology (*Shakspeare*).

**ADVOCATION** among civilians the act of calling another to assist in pleading some cause.

**ADVOCATION, LETTERS OF**, in the law of Scotland a writ issued by the lords of session, advocating or calling a cause from an incompetent judge to them selves.

**ADVOCATIONE DECIMARUM**, a writ which lies for claiming fourth part of tithes or other rights belonging to any church.

**ADVOLUTION** *s* (*advolutio*, *advolutum*, Lat.) The act of rolling to something.

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**ADVOLUTION** *s* (*advolutio*, Lat.) The act of rolling to something.

**ADVOIRY** *s* (*avoutrie*, Fr.) Adultery (*Bacon*).

**ADVOW**, in ancient law books, signifies to justify or maintain an act formerly done it also signifies to call upon or produce.

**ADVOWEE**, in ancient customs and law books, denotes the advocate of a church, religious house, or the like. There were advowees of cathedrals, abbies, monasteries, &c. Thus, Chertemagne had the title of advowee of St. Peter's, king Hugh, of St. Riquier, &c. These advowees were the guardians, protectors, and administrators of the temporal concerns of the churches, and under their authority were passed all contracts which related to them. It appears also, from the most ancient charters, that the donations made to churches were conferred on the persons of the advowees. They always pleaded the causes of the churches in court and distributed justice for them, in the place under their jurisdiction. In a statute Edw. III. we meet with advowee paramount, for the highest patron, that is, the king.

**ADVOWSON**, or **ADVOWSEN**, in common law, signifies a right to present to a vacant benefice. Advowsons formerly were most of them appurtenant to manors and the patrons were pious lay barons the lordship of the manor, and patronage of the church, were seldom in different hands, until advowsons were given to religious houses. But of late times, the lordship of the manor and advowson of the church have been divided. Advowsons are presentative collative or donative presentative, where the patron presents or offers his clerk to the bishop of the diocese, to be instituted in his church, collative where the benefice is given by the bishop is original patron thereof, or by means of a right he has acquired by lapse, donative, is where the king or other patron does by a single donation in writing, put the clerk into possession, without presentation, institution, or induction. Colleges holding more advowsons in number than a moiety of the fellows, are not capable of purchasing more. Grants of advowsons by papists are void. Advowsons are temporal inheritances and by fees, they may be granted by deed or will, and are assets in the hands of heirs or executors. Presentations to advowsons for money, or other reward, are void. 31 Eliz. cap. 6. See Burn's Eccles. Law vol. 1. For more on this subject, see Tomlinson's Jacob's Dictionary art. Advowson.

**ADVOWTRY** See **ADULTRY**.

**ADURE** *v* *n* (*aduro*, Lat.) To burn up (*Bacon*).

**ADUST** *a* (*adustus*, Lat.) 1 Burnt up, scorched (*Bacon*). 2 It is generally now applied to the complexion and humours of the body (*Pope*).

**ADUSTED** *a* (See **ADUST**) Burnt, dried with fire scorched (*Milton*).

**ADUSTIBLE** *a* (from *adust*) That may be adusted, or burnt up.

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**ADUSTION** *s* (from *adust*) The act of burning up, or drying, as by fire (*Harvey*)

**ADY**, in natural history, a name given to a palm-tree of the island of St. Thomas

**DYNAMIA** (from *a priv* and *δυναμις, power*) A defect of vital power constituting in Cullen, order II of the class neuroses, and comprehending syncope, dyspepsia, and hypochondriasis

**ADYTIUM**, in pagan antiquity, the most retired and sacred place of their temples into which none but the priests were allowed to enter. The term is purely Greek, signifying inaccessible.

**ADZE**, or **ADDICE**, a cutting tool, of the ax-kind, having its blade in side thin, and arching, and its edge at right angles to the handle, chiefly used for taking off thin chips of timber or boards, and for joining away certain irregularities which the ax cannot come at.

**Æ**, or **Æ**, a diphthong compounded of *A* and *F*. Authors are by no means agreed as to the use of the *æ* in English words. Some, from a consideration that it is no proper diphthong, in our language (its sound being no other than that of the simple *e*), contend that it ought to be entirely disused, and, in fact, the simple *e* has of late been much adopted instead of the Roman *æ* in the word *equator*, &c.

**ÆACLA**, in antiquity, feasts and combats, celebrated in Ægina, in honour of their king Æacus.

**ÆACUS**, the son of Jupiter by Ægina. When the isle of Ægina was depopulated by a plague, his father, in compassion to his grief, changed all the ants upon it into men and women who were called Myrmidons, from *μύρμηξ* an ant. The foundation of the fable is said to be, that when the country had been depopulated by pirates, who forced the few that remained to take shelter in caves. Æacus encouraged them to come out, and by commerce and industry recover what they had lost. His character for justice was such, that, in a time of universal drought, he was nominated by the Delphic oracle to intercede for Greece, and his prayer was answered. The pagans also imagined that Æacus, on account of his impartial justice, was chosen by Pluto one of the three judges of the dead, and that it was his province to judge the Europeans.

**ÆCHMAIOTARCHIA**, in antiquity a Greek term, signifying the chief, or leader of the Jewish captives in Babylon. The Jewish name was *rosch-galeth*.

**ÆCIDIDIUM**, a genus of the Innærn class and order cryptogamia, fungi, with membranous cases, globose both sides filled with naked seeds not cohering. Its species are eleven, of which some are clustered, and others solitary.

**ÆDES**, in Roman antiquity, signified ordinarily a house, but often a chapel or inferior kind of temple not consecrated.

**ÆDIL E**, **ÆDILIS**, among the ancient Romans, implied a magistrate, whose chief business consisted in superintending edifices of all kinds, especially those which belonged to the

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public, as temples, aqueducts, bridges &c. They had also the care of the highways, public places, weights, and measures. The prices of provisions were also fixed by the *ædiles*, who also punished lewd women, and such persons as frequented gaming houses. They had the custody of the plebiscita, or orders of the people, inspected all comedies, and other pieces of wit, and were obliged to exhibit magnificent games to the people at their own expence. There were originally only two *ædiles*, who were chosen out of the common people, but these in general being unable to support the enormous expence attending their office, two others were created out of the patrician order: these took upon themselves the charges of the games, and were called *ædiles curules*, or *major*, as the two plebeians were stiled *minor*. Julius Cæsar, in order to ease these four magistrates, increased their number to six, calling the two additional ones *ædiles cereales*, from their having the inspection of all manner of grain committed to their care.

**ÆDITUUS**, in Roman antiquity, an officer belonging to the temple, who had the charge of the offerings, treasure, and sacred utensils. The female deities had a woman officer of this kind called *Æditui*.

**ÆDOIA**, the same as **PUDENDA**.

**ÆDON**, daughter of Pandion married Zethus brother to Amphiion, by whom she had a son called Ixylus. She was so jealous of her sister Niobe, because she had more children than herself, that she resolved to murder the elder, who was educated with Ixylus. She by mistake killed her own son and was changed into a nightingale as she attempted to kill herself.

**ÆDORIA**, (*ædora* from *ædō* modesty, or from *ædō* and *ædō* to see) The pudenda, or external sexual organs in females.

**ÆDOSPIIA** (*ædosopia* from *ædō* and *spōia* to break und) status from the womb passing through the vagina.

**ÆGIANSEA** (ancient geography), now the Archipelago, a part of the Mediterranean, separating Europe from Asia and Africa, washing on one hand Greece and Macedonia on the other Caria and Ionia. The origin of the name is greatly disputed. Ptolemy advanced three opinions, one, that it is so called from the many islands therein, at a distance appearing like so many goats' mother because *Ægea* queen of the Amazons perished in it a third opinion, because *Ægeus* the father of Theseus threw himself headlong into it.

**ÆGEUS**, king of Athens, son of Pandion, being desirous of having children, went to consult the oracle and in his return, stopped at the court of Pittheus, king of Troezen, who gave him his daughter Æthra in marriage. He left her pregnant, and told her, if she had a son to send him to Athens as soon as he could lift a stone under which he had concealed his sword. By this sword he was to be known to Ægeus, who did not wish to make any public discovery of a son, for fear of his nephew, the Pallantides, who expected his crown. Æthra became



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mother of Theseus, whom she accordingly sent to Athens with his father's sword. At that time Ægeus lived with Medea, the divorced wife of Jason. When Theseus came to Athens, Medea attempted to poison him, but he escaped, and upon showing Ægeus the sword he wore, discovered himself to be his son. (Apollodorus Paus. &c.) The Ægean sea is supposed to be called after him. Theseus when he returned from Crete, omitted to hoist white sails as a signal of his subduing the Minotaur, so he had agreed with Ægeus. His disconsolate father at the sight of the black sails, threw himself into this sea. Ægeus reigned 48 years, and died B. C. 123.

**ÆGIA**, (*ægia* from *aiç* a goat,) a white concretion in the pupil of the eye, so called because goats are said to be frequently subject to it.

**ÆGICERAS** In botany, a genus of the Linnean class and order pentandria, monogynia, thus distinguished: Calyx five-cleft, petals five, capsular curved, one-celled, one-valved, one-seeded. It has been only found in the Moluccas, which produce two species, the *major* and *minor*.

**ÆGIDION**, a name given to a colluvium for inflammations and defluxions of the eye.

**ÆGILOPS**, or **ÆGYLOPS**, (*ægylowp* from *aiç* and *wp* the eye.) In surgery an ulcer in the internal canthus of the eye, so called, because goats are said to be peculiarly subject to it. 2 The holm-oak, because its acorns resemble a goat's eye. 3 The great wild oat grass, or dink, resembling in colour the goat's eye, constituting a genus of the Linnean class and order polygama, monocera thus characterized: herm. calyx, glume or husk about three flowered, cartilaginous, corol, glume ending in a triple row, stamens three, styles two, seed one. Male stamens three. It is a native of the south of Europe and affords four species to the eye of the naturalist.

**ÆGINA**, daughter of Asopus, had Æacus by Jupiter changed into a flume of fire. She afterwards married Actor son of Myrmidon, by whom she had some children, who conspired against their father. Some say that she was changed by Jupiter into the island which bears her name.

**ÆGINA**, an island formerly called Cænopia, in a part of the Ægean sea, called Saronicus Sinus. The inhabitants were very powerful by sea, and gave themselves to Darius when he demanded submission from all the Grecians. The Athenians under Pericles expelled them from their possessions, the island is now called Nigra. Herodotus Strab. &c.

**ÆGINETIA** In botany, a genus of the Linnean class and order didymia, triglosspermia, thus characterised: calyx one leaved, spathaceous, or sheathy, corol campanulate, two-lipped, capsule many celled. The only species known of it is a native of Malabar.

**ÆGIOCUS**, a name of Jupiter, from his using the goat Amalthæa's skin, instead of a shield, in the war of the Titans.

**ÆGIPHILA** In botany, a genus of the

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**ÆGNEAN** class and order tetrandria, monogynia thus characterised: calyx four-toothed; corol four-cleft; style scabrid, berry two-celled, with two seeds in each. It is an inhabitant of both the Indies, and eight species of it have been discovered.

**ÆGIRA**, a town of Achæa, supposed to be founded by Ægeus, the sixth king of Sicyon, and situate between Ægium and Sicyon, opposite to Parnassus. It is now a small village called Hylocastro.

**ÆGIS**, in the ancient mythology, a name given to the shield or buckler of Jupiter and Pollux. The goat Amalthæa, which had suckled Jove being dead, that god is said to have covered his buckler with the skin thereof, whence the appellation ægis, from *aiç*, *ægo*, she goat. Jupiter, afterwards restoring the beast to life again, covered it with a new skin, and placed it among the stars. As to his buckler, he made a present of it to Minerva, whence that goddess's buckler is also called ægis. Minerva, having killed the Gorgon Medusa, nailed her head in the middle of the ægis, which henceforth had the faculty of converting into stone all those who looked thereon, is Medusa herself had done during her life. Others take the ægis not to have been a buckler but a cuirass or breast-plate.

**ÆGISTHUS**, son of Thyestes by his own daughter Philopœa, who, to conceal her shame, exposed him in the woods. Some say he was taken up by a shepherd, and suckled by a goat, whence he was called Ægisthus. He corrupted Clytemnestra the wife of Agamemnon, and with her assistance slew her husband, and reigned seven years in Mycenæ. He was, together with Clytemnestra slain by Orestes. Pompey used to call Julius Cæsar Ægisthus, on account of his having corrupted his wife Mutia, whom he afterwards put away though he had three children by her.

**ÆGIUM**, (ancient geography) a town of Achæa Propria, five miles from the place where Helæ stood, and famous for the council of the Achæans, which usually met there, on account either of the dignity, or commodious situation of the place. It was also famous for the worship of *Ægiæ*, a conventional Jupiter and of Panchæia Ceres. The territory of Ægium was watered by two rivers viz the Phoenix and Megimæa. The epithet is *Ægiensis*.

**ÆGIL** In botany, a genus of the Linnean class and order polyandria, monogynia thus distinguished: calyx five lobed, petals five, berry globular many-celled, with numerous seeds in each. The only known species of this genus is a tree in the East Indies with thorny branches, and a fruit equally delicious to the taste and fragrant to the smell.

**ÆGILIA**, (*ægilia* from *aiç*) the same as Ægis.

**ÆGOCROS** in astronomy, a name given to the constellation Capricorn. Thus says Lucan "Varu mutator circulus anni."

"Ægoceron, cancrumque tenet" Pan, dignified by the poets, and elevated to

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the stars, transformed himself into a goat, and was called *Ægoceros*.

**ÆGOPDIUM**, (from *αἴγος* or, (reversed) *αἴγα ποδός*, *the goat*) Gout-weed, or nut-wort, so named from its supposed benefit in this disease called also wild ingelica, or herb gerard. A genus in the Linnean class and order pentandria, trigynia, thus characterised, fruit ovate-oblong, ribbed, petals inflected, heart shaped, unequal. The only known species is to be found wild in our own hedges and road sides, with small white flowers, and leaves resembling those of the angelica.

**ÆGOPRI CORN** In botany, a genus of the Linne in class and order monœcia, diandria. Its male is in ament, common calyx three-cleft, partial one tubular, corollless, anther four-lobed. In its female the flowers are solitary, calyx as in the male, corollless, styles three, united at the base, capsule three grained. The only known species is a tree of the East Indies, with flowers issuing from the end of the branchlets.

**ÆGYPTIACUM** An ointment consisting of honey, verdigrise and vinegar (*Quina*).

**ÆINAUIA**, in antiquity, a name given to the senators of Miletus, because they held their deliberations about a ship.

**ÆI**, or **ÆAI**, or **AI**. In compound name all, or altogether. So Aldred altogether reverend Alfred altogether peaceful (*Gilsen*).

**ÆLI**, implies assistance. So Hefvin is victorious (*Gilson*).

**ÆLIA CAPITOLINA**, a name given by the emperor Adrian from Ælius that of his own family, and Capitolinus the epithet of Jupiter, to the new city which he caused to be built about A. D. 134, near the spot where the ancient Jerusalem stood, and which on his visit to the eastern parts of the Roman empire he found in ruins.

**ÆLIAN CLAUDIUS**, a Roman sophist of Præneste, in the reign of Adrian. He first taught rhetoric at Rome, but being disgusted with his profession he became author, and published treatises on animals in seventeen books, on various history in fourteen books, &c. in Greek, a language which he preferred to Latin. He was surnamed *Μελιγλωσσος*, *honey mouthed*, on account of the peculiar sweetness of his style. Martial refers to this excellence lib. xii. epigr. 24.

“O jucunda, Covine, solitudo,

Carrucæ magnæ, cæcædoque grutum

Fæcundi mihi munus Æliani

**ÆLURUS**, in mythology, a deity worshipped by the ancient Egyptians, under the form of a cat, or that of a man, with the head of that animal. They had likewise a goddess, whom they represented under the figure of a woman with the head of a cat. The Egyptians had so superstitious a regard for this animal, that the killing it, whether by accident or design, was punished with death and Diodorus relates, that in the time of extreme famine they chose rather to eat one another, than touch these sacred animals.

**ÆMOBOLIUM**, in antiquity, the blood of

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a bull or ram, offered in the sacrifices called taurobolia and criobolia.

**ÆNARIA**, an island in the bay of Cumæ, which Pliny says derived its name from its being the station of the ships of Æneas.

**ÆNLAS**, in fabulous history, a famous Trojan prince, son of Anchises and Venus. At the destruction of Troy he bore his aged father on his back, and saved him from the Greeks, but being too solicitous about his son and household gods, lost his wife Creusa getting on board a ship, he set sail, and landed in Macedonia, in Sicily, and in Africa, where he was kindly received by queen Dido, but forsaking her he landed in Italy, where he married Lavinia the daughter of king Latinus, and defeated Turnus, to whom she had been contracted. After the death of his father-in-law he was made king of the Latins, over whom he reigned three years but joining with the Aborigines, he was slain in a battle against the Tuscans. Virgil has rendered the name of this prince immortal, by making him the hero of his poem.

**ÆNEID**, the name of Virgil's celebrated epic poem. There is nothing in antiquity to equal the sixth book of the *Æneid*. Yet, a late writer, Mr. La Harpe, in his *Lectures on Lectures* at the Lycæum, does not allow Virgil to be the inventor of a single incident, and scarcely of a verse in his poem. He acknowledges however, that the third, fourth, and sixth books are admirable productions. In the estimation of this author, the excellence of Virgil rests on the constant perfection of his style, to surpass which seems impossible. It is a once, he says, the delight and despair of all who wish to cultivate poetry, so that if he has not equaled Homer in invention, variety, or constant interest, he has surpassed him in the beauty of particular parts, and in the fine taste with which he has embellished his narratives.

**ÆNI**, in ancient geography, an island of the Red sea, situated to the east of Hippos and south of the Euxine gulf.

**ÆNIGMA**, a proposition put in obscure ambiguous, and generally contradictory terms, to puzzle, or exercise the wit, in finding out its meaning, or, in obscure discourse, covering some common and well-known thing, under remote and common terms. The word is formed of *αἰνιτίζω*, *obscure innuere, to hint a thing darkly*, of *αἶνος*, *an obscure speech, discourse*. The Italians sometime call it *serpus serpus*, or *serapus*. The populace with us name it riddle, from the Belgic *raeden*, or the Saxon *araethan*, to interpret. The use of ænigmas was very great among the Egyptians. Gild thinks they might borrow their custom from the Hebrews, among whom, it is certain, ænigmas were not less in use. Witness Samson's riddle, Judg. xiv. 12, 13. I will now put forth a riddle to you, &c. *וְעֵתָּה*, *i. e.* according to Vatable, an ænigmatical problem. The LXX render it, *πρόβλημα*. Solomon is said to have been particularly skilful in the solution of ænigmas. Joseph Antiq. lib. v. cap. 2.

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Clement assures us, that the Egyptians placed sphinges before their temples, to intimate that the doctrines of God and religion were ænigmatical and obscure. See **HIEROGLYPHIC**.

Ænigmas consist in words, which, whether they be in prose or verse, contain either some description, a question, or a propopœia. The last kind are the most pleasing, inasmuch as they give life and action to things which otherwise have them not. To make an ænigma, therefore, two things are to be pitched on, which bear some resemblance to each other, as the sun and a monarch, or a ship and a house: and on this resemblance is to be raised a superstructure of contrivances to amuse and perplex. It is easier to find great subjects for ænigmas in figures than in words, inasmuch as painting attracts the eyes and excites the attention to discover the sense. The subjects of enigmas in painting, are to be taken either from history or fable, the composition here is a kind of metamorphosis, wherein, e. g. hum in figures are changed into trees, and rivers into metals. It is essential to ænigmas, that the history or fable, under which they are presented, be known to every body, otherwise it will be two ænigmas instead of one, the first of the history or fable: the second of the sense in which it is to be taken. Another essential rule of the ænigma is, that it only admit of one sense. Every ænigma which is susceptible of different interpretations, all equally natural, is so far imperfect. The alchemists are great dealers in the ænigmatic language, their processes for the philosopher's stone being generally wrapped up in riddles. e. g. *Fac ex mare et fœmina circulum, inde quadrangulum hunc triangulum, fac circulum, et habebis libidem philosophorum*.—**Menestricus** has attempted to reduce the composition and resolution of enigmas to a kind of art with fixed rules and principles: which he calls the philosophy of ænigmati images. There are some ænigmas in history, complicated to a degree which much transcends all rules: and has given great perplexity to the interpreters of them. Such is that celebrated ancient one *Ælia Lælia Crispis*, about which many of the learned have puzzled their heads. There are two exemplars of it: one found 140 years ago on a marble near Bologna, the other in an ancient MS. written in Gothic letters, at Milan. It is controverted between the two cities, which is to be reputed the more authentic.

The Bononian Ænigma

D M

Ælia Lælia Crispis,

Nec vir, nec mulier,

Nec androgynæ,

Nec puella, nec juvenis

Nec anus,

Nec casta, nec meretrix,

Nec pudica,

Sed omnia

sublata

Neque sanæ, neque sceleræ,

Neque veniæ,

Sed ornatibus

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Nec cælo, nec terris,

Nec aquis,

Sed ubique jactat

Lucius Agatho Priscius,

Nec maritus, nec amator,

Nec necessarius,

Neque merens, neque gaudens,

Neque fletus,

Hanc,

Nec molem, nec pyramidem,

Nec sepulchrum,

Sed omnia,

Scit et nescit, cui posuerit

That is to say To the gods in vices, Ælia Lælia Crispis, neither man, nor woman, nor hermaphrodite, neither girl, nor young woman, nor old, neither chaste, nor a whore, nor a modest woman, but all these: killed neither by hunger, nor steel, nor poison, but by all these: rests neither in heaven, nor on earth, nor in the waters, but every-where. Lucius Agatho Priscius, neither her husband, nor lover, nor friend, neither sorrowful, nor joyful, nor weeping, certain, or uncertain, to whom he rears this monument, neither erects her a temple, nor a pyramid, nor a tomb, but all these. In the MS. at Milan, instead of D M we find A M P P D and at the end the following addition

Hoc est sepulchrum intus cadaver non habens

Hoc est cadaver sepulchrum extra non habens,

Sed cadaver idem est & sepulchrum sibi

i. e. Here is a sepulchre without a corpse, here is a corpse without a sepulchre: the corpse and sepulchre are one and the same. We find near fifty several solutions of this ænigma advanced by learned men. Marius Michael Angelus maintains Ælius Lælius Crispus to signify rain-water falling into the sea. R. Vitus first explained it of Niobe turned to a stone, afterwards of the rational soul, and afterwards of the Platonic idea, Jo. Turrius, of the materia prima, H. Schottius, of an eunuch, by others it has been thought, a lawsuit, a shadow, music, hemp, friendship, chastity, pope Joan, Lot's wife, the christian church, &c. &c.

**ÆNIGMATICAL**, something which relates to, or partakes of, the nature of enigmas.

**ÆNIGMATOGRAPHER**, or **ÆNIGMATIST**, a maker or explainer of enigmas.

**ÆNIGMATOGRAPHY**, or **ÆNIGMATOLOGY**, the art of making, or of explaining, or of collecting enigmas.

**ÆNITHOLOGICUS**, in poetry, a verse of two dactyls, and three trochees, as *Prælia dira placent trunci juvenete*.

**ÆOLIC**, or **ÆOLIAN**, in grammar, denotes one of the five dialects of the Greek tongue. It was first used in Boeotia, whence it passed into Æolia, and was that which Sappho and Alcaeus wrote in. The Æolic dialect generally throws out the aspirate or sharp spirit, and agrees in so many things with the Doric dialect, that the two are usually confounded together.

**ÆOLIC VERSE**, *carmen Æolicum*, a kind of measure, consisting first of an iambic, or

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spondee, then of two anapests, divided by a syllable, and lastly, a syllable common

**ÆOLIPILE**, in hydraulics, a hollow ball of metal, with a very small hole or opening, chiefly used to shew the convertibility of water into elastic steam. The best way of fitting up this instrument, is with a very slender neck or pipe, to screw on and off, for the convenience of introducing the water into the inside, for by unscrewing the pipe, and immersing the ball in water, it readily fills, the hole being pretty large, and then the pipe is screwed on. But if the pipe do not screw off, its orifice is too small to force its way in against the included air, and therefore to expel most of the air, the ball is heated red hot, and suddenly plunged with its orifice into water, which will then rush in till the ball is about two-thirds filled with the water. The water having been introduced, the ball is set upon the fire, which gradually heats the contained water, and converts it into elastic steam, which rushes out by the pipe with great violence and noise, and thus continues till all the water is so discharged, though not with a constant and uniform blast, but by fits and the stronger the fire is, the more elastic will the steam be, and the force of the blast. Care should be taken that the ball be not set upon a violent fire with very little water in it, and that the small pipe be not stopped with any thing, for in such case, the included elastic steam will suddenly burst the ball with a very dangerous explosion. This instrument, Des Cartes, and others, have made use of to account for the natural cause, and generation, of wind. And hence its name, *Æolipila*, *q d pila Æoli*, *Æolus's ball*, or *Αἰολοπιλάη, the gate of Æolus*. Dr Plott gives an instance where the Æolipile is actually used to blow the fire the Lord of the Manor of Fressington is bound by his tenure to drive a goose every New-year's day, three times round the hill of the lord of Hilton, while Jack of Hilton (a brazen figure having the structure of an Æolipile) blows the fire.

**ÆOLIS**, or **ÆOLIA**, in ancient geography, a country of Asia minor, situate between Troas to the north and Ionia to the south. According to Strabo it extended from the promontory Iectus to the river Hermus, and contained eleven cities. The Ælians according to Josephus were descended from Ishah, one of the sons of Javan, while the Greek historians say they descended from Æolus.

**ÆOLUS**, in mechanics, a small machine, the invention of Mr Iidd, calculated for changing the air in rooms when too hot or unfit for respiration. It supplies the place of a square in the window, and works with very little noise, like the sails of a common window ventilator.

**Æolus**, in mythology, the god of the winds, was the son of Hippotas, by Menecla, the daughter of Hyllus, king of Lipara. He dwelt in the island Strongyle, one of the seven islands that are called Æolus, as being under the dominion of Æolus. Others say, that his residence was in the island Lipara, and others

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at Rhegium, in Italy. But all agree in giving him an absolute authority over the winds, which they say he confined in a vast cavern, and let loose whenever he pleased. The name seems to be derived from *αἰολος* *various*, because the winds over which he presided are ever varying.

**ÆOLUS'S HARP**, a very pleasing musical instrument, invented by Kitcher. The construction is perfectly simple, consisting of little more than a number of catgut or wire strings, distended in parallel lines over a box of wood with a thin top containing soundholes. When the strings are tuned unison and the instrument is placed in a proper situation to receive a current of air, it produces by the tremulous motion given by the wind to the strings, a soft, murmuring and pleasing combination of sounds, which is beautifully described by Thomson in his *Castle of Indolence*.

“A certain music never known before

Here lull'd the pensive melancholy mind,  
Full easily obtain'd. B'choves no more,

But addlong, to the gently waving wind  
To lay the well-tuned instrument reclind,  
From which, with airy-flying fingers light,  
Beyond each mortal touch the most refin'd,  
The god of winds drew sounds of deep  
delight,

Whence, with just cause, the harp of Æolus,  
it lught

Several attempts to explain the principles of the wild harmony of this instrument have been made by different authors, but we have seen none so satisfactory as that of Dr M. Young, which is subjoined. The particles of a current of air, which strike against the middle point of a stretched elastic string, will move the whole string from its rectilinear position, and is no blast continues of the same strength for any considerable time, although it be able to remove the string from its rectilineal position; yet, unless it be too rapid and violent, it will not be able to keep it bent, the fibre will therefore, by its elasticity, return to its former position, and by its acquired velocity pass it on the other side, and so continue to vibrate and excite pulses in the air, which will produce the tone of the entire string. But, if the current of air be too strong and rapid when the string is bent from the rectilineal position, it will not be able to recover it, but will continue bent and bellying like the keel of a ship in a brisk gale. However though the whole string cannot perform its vibrations, the subordinate aliquot parts may, which will be of different lengths in different cases according to the rapidity of the blast. Thus when the velocity of the current of air increases so as to prevent the vibration of the whole string, the particles which strike against the middle point of the halves of the string agitate those halves, and as these halves vibrate in half the time of the whole string, though the blast may be too rapid to admit of the vibration of the whole, yet it can have no more effect in preventing the motion of the halves, than it would have on the whole string, were its tension quadrupled, for

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the times of vibrations in strings of different lengths, agreeing in other circumstances, are directly as the lengths, and in strings differing in tension, and agreeing in other circumstances, inversely as the square roots of the tensions, (see CHORD) and therefore, their vibrations may become strong enough to excite such pulses as will affect the drum of the ear and the like may be said of other aliquot divisions of the string. Those particles which strike against such points of the string as are not in the middle or aliquot parts, will interrupt and counteract each other's vibrations, as is the case of sympathetic and secondary tones, and therefore will not produce a sensible effect. When Æolian notes are heard which are not produced by any submultiple of the string (see HARMONICS,) they are very transitory, and immediately vary their pitch, till they coincide with the notes next above or below them, which are produced by exact aliquot parts of the whole string and thus the harmony is never interrupted by long continued discords.

**ÆON**, (*aior, age*;) literally signifies the duration of a thing.

**ÆON**, (*aiwy, time, life, duration*;) the life or spirit of man in the spinal marrow, or function of life.

**ÆON**, among the followers of Plato, was used to signify any virtue, attribute, or perfection: hence they represented the deity as an assemblage of all possible æons, and called him *πληρωμας*, a Greek term signifying *fullness*. The Valentines, who, in the first ages of the church, blended the conceits of the Jewish cabalists, the Platonists, and the Chaldean philosophers, with the simplicity of the Christian doctrine, invented a kind of Theogony, or Genealogy of Gods (not unlike that of Hesiod,) whom they called by several glorious names, and all by the general appellation of *Æons*, among which they reckoned *zay, Life, Λοφα, Word, Μωυσεως, Only-begotten, Πληρωμα, Fullness*, and many other divine powers and emanations amounting in number to thirty which they fancied to be successively derived from one another, and all from one self-originated deity, named Bythus, i. e. profound or unfathomable, whom they called likewise, The most high and ineffable Father. See VALENTINIANS.

**ÆORA**, among ancient physicians, a peculiar kind of exercise, which consisted in being carried about in a litter or other vehicle. Sometimes the patient's bed was hung by ropes, in the manner of a hammock, and moved backwards and forwards. Travelling in a chariot, or on board a ship or boat, were also accounted so many kinds of *æoro*.

**ÆQUALIS POLYGAMIA**, (Equal Polygamy.) The name of the first order in the class Syngenesia of Linnæus's system, containing those compound flowers, which have all the florets hermaphrodite and alike. See BOTANY.

**ÆQUE**, (from *æquus*, equal,) equally the same as ana.

**ÆQUISONANT** a musical term, properly applicable to unisons but which is frequently

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given to octaves, because they so affect the ear almost to seem one and the same sound.

**ÆR**, (*ang*, from *אור aor, light, ether*, Hebr.) The transparent, elastic fluid that surrounds the globe.

**ÆR FIXUS** See CARBONIC ACID.

**ÆRA**, in chronology, is the same as epoch, or epocha, and means a fixed point of time, from which to begin a computation of the years ensuing. The word is sometimes also written *era* in ancient authors. Its origin is contested, though it is probably from the Arabic for time appointed. Some imagine that it is formed from a *er* a the abbreviations of the words *annus erat Augusti*, or from a *era* the initials of the words *annus erat regni Augusti*, because the Spaniards began their computation from the time that their country came under the dominion of Augustus. For an account of the principal *æras* see EPOCH.

**ÆRA** also means the way or mode of accounting time. Thus we say such a year of the Christian *æra*, &c.

**ÆRARIUM**, the treasury or place where the public money was deposited amongst the Romans. *Ærarium* differs from *fiscus*, as the first contained the public money, the second that of the prince: the names are, however, sometimes used indiscriminately. There are several treasuries mentioned in history, as *Ærarium Sanctius, Privatum, Vicissimarum, Illithyæ, Veneris*, &c.

**ÆRARIUS**, a name variously applied by the Romans: 1 To a degraded citizen. 2 To an officer who distributed money to the soldiery, or people. 3 To one employed in coming or working brass. 4 To a soldier who received pay.

**ÆRATA AQUA** See ZIMENT WATER.

**ÆRATED IRON** a name given by Bergman to what is commonly called rust of iron, but which modern chemists denote by carbonate of iron, being formed by the union of that substance with the water and carbonic acid supplied by the atmosphere. See CARBONATE OF IRON.

**ÆRATED MURIATIC ACID**, called by Scheele dephlogisticated muriatic acid, is a combination of that acid with the base of vital air, or the oxygenous principle, and is now termed oxygenated muriatic acid, which see.

**ÆRATED MINERAL ALKALI** See CARBONATE OF SODA.

**ÆRATED VEGETABLE ALKALI** See CARBONATE OF POTASH.

**ÆRATED WATER**, so called by Bergman, is water impregnated with carbonic acid by shaking these two fluids together, so as to bring them as much as possible into contact with one another. It is somewhat heavier than distilled water, agitation makes it sparkle, it has a pungent acidulous taste, and reddens the tincture of turnsol. Heat decomposes it, soon brings it to a state of ebullition, and disengages the elastic fluid. The contact of air produces the same effect, and, therefore, to preserve this acidulous liquor, it must be enclosed in vessels properly stopped, and standing in a cool

place, or strongly compressed. This acid solution abounds throughout nature acidulous and gaseous waters, such as those of Pyrmont, Seltz, &c consist of it. In consequence of its great use in all putrid disorders, either by drinking or bathing, methods and machines have been invented to impregnate with ease and expedition any quantity of water with as much of the carbonic acid as it can maintain in solution. Dr Priestley was the first who gave an account of the process, but it has since been much improved by Dr Nouth Mr Parker, and Magellan. See Dr Priestley's Experiments on Air, vol v p 83 and 112. (See MINERAL WATERS in this Dictionary). The term aerated water is sometimes applied, and perhaps with more propriety, to water containing atmospheric air, to distinguish it from boiled water which has been deprived of its air by heat.

**AERIAL ACID**, the same as CARBONIC ACID, which see.

**AERIAL PERSPECTIVE**, is that which represents bodies diminished and weakened in proportion to their distance from the eye. Aerial perspective chiefly respects the colours of objects whose force and lustre it diminishes more or less, to make them appear as if more or less remote. It is founded upon this, that the longer the column of air an object is seen through, the more feebly do the visual rays emitted from it affect the eye.

**ALRIANS**, in church histo<sup>y</sup>, a branch of Arius who to the doctrines of that sect added some peculiar dogmas of their own, viz, that there is no difference between bishops and priests, a doctrine maintained by many modern

divines, particularly of the presbyterian and reformed churches. The sect received its denomination from Aërius an Armenian priest of the fourth century.

**AERIEL** *a* (*aërius*, Lat) 1 Belonging to the air, as consisting of it (*Aërl*) 2 Produced by the air (*Dryden*) 3 Inhabiting the air (*Milton*) 4 Placed in the air (*Popè*) 5 High, elevated in situation (*Phelps*)

**AERIFORM FLUIDS**. See GAS.

**AERITIS** (*αἰρίτις* from *αἰρ*, the air) The jasper-stone from its sky-blue tinge, also, for the same reason the herb blue pimpernel.

**AFROGRAPHY**, (from *αἰρ*, air, and *γραφω*, I describe) a description of the air or atmosphere, its limits, properties, &c amounting to much the same as Aëtiology, unless the latter be confined to the theory, and the former to the description.

**ALROTHS** (from *αἰρ*, the air, and *λίθος*, a stone) air-stones: a name lately given to those solid bodies composed of several mineral substances, which have been seen to fall from the atmosphere. The descent of any such bodies was for a long time doubted the popular opinion that attested their reality being regarded as a vulgar prejudice, but the fact has been often proved of late in such a manner as to leave no reasonable doubt of the existence of the phenomenon. The following table drawn up by M Larn, a philosopher who has paid considerable attention to the history of aeroliths exhibits a collection of the best authenticated instances of the falling of stones, &c from the atmosphere hitherto observed together with the time when they fell, and the persons on whose evidence the fact rests.

Substance	Places where they fell	Period of their Fall	Testimony
Shower of stones	At Rome	Under Julius Ho tius	Livy
Shower of stones	At Rome	Under M. Marius & M. Torquatus	Livy
Shower of iron	In the ruins of the city of Rome	Year before the great of C. C. C.	Pliny
Shower of mercury	In Italy	Second year of the 78th Olympiad	Dion
A very large stone	Near the river Negro, in the	Year before 1 C. C. C.	Pliny
Three large stones	In Phære	January 4th 1717	Ch. of Count Marcellin
Shower of fire	At Quirnoy	January 1706	Coffroy le Cadet
Stone of 72 lbs	Near Larissa, Macedonia	In 1510	Paul Lucas
About 100 stones	Near Padua, in Italy	November 27th, 1627	Carden Varcit
Another of 60 lbs	On Mount Vaisir, Provence	April 6th, 1711	Cassendi
Another of 50 lb	In the Atlantic	Year before 1 C. C. C.	Érè la Teullee
Shower of sand for 1 hour	Sodom and Gomorrah	In 1608	Moses
Shower of sulphur	In the duchy of Mansfield	In 1646	Springenberg
Sulphureous rain	openhackin	October 1711	Olaus Wormius
The same	Brunswick	In 1699	Segebar
Shower of sulphur	Ireland	September 1713	Muschenbroeck
Ditto of a viscid unknown matter	Liponas in Breve	In 1750	Delalande
100 large stones weighed 40 lbs	Niort Normandy	September 13th, 1768	Delalande
A stony mass	At Juce, in Le Maine	In 1768	B. de la Hay
A stone of 7½ lbs	At Air in Artois	July 24th, 1790	Gurson de Boyaval
A stone	In the Cotentin	July 1748	Morand
A stone	In the Cotentin	December 13th 1790	t Amand Baudin, &c
Extensive shower of stones	In the Cotentin	March 17th, 1798	Earl of Bristol
About 12 stones	Sienna Tuscany	February 19th, 1790	Captain Topham
A large stone of 56 lbs	Wold Cottage Yorkshire	December 19th, 1790	Leclerc and De Dree
A stone of about 20 lbs	Sale, department of the Rhone	December 19th, 1790	Southey
A stone of 10 lbs	In Portugal	April 5th, 1800	F. Lloyd Williams, Esq
Shower of stones	Benares East Indies	Very old	de Bori
Shower of stones	At Plann, near Tabor, Bohemia	July 1789	Philosophical Magazine
Mass of iron 70 cubic feet	Absakank, Siberia	November 7th, 1402	allas (bladni, &c
Mass of ditto, 16 quintals	Barboutan, near Roquefort	In 1762	Darcey, jun Lomet, &c
Shower of stones	Ensbheim, Upper Rhine	March 12th, 1798	Butenschoen
Large stone, 200 lbs	Near Verona	April 20th, 1803	Acad de Bourd
Two stones, 200 and 300 lbs	Near near Villé Franche		de Dree
A stone of 20 lbs	Near T. Aisle, Normandy		Fourcroy
Several ditto, from 10 to 17 lbs			

The larger sort of these stones have been seen as luminous bodies to move with very great velocities, descending in oblique directions, commonly with a loud hissing noise, resembling that of a mortar shell, or cannon

ball, or rather, that of an irregular hard mass, projected violently through the air, surrounded by a blaze or flame, tapering off to a narrow stream in the hinder part of it, are heard to explode or burst, and seen to fly in pieces, the

larger parts going foremost, and the smaller following in succession they are thus seen to fall on the earth, and strike it with great violence, and on examining the place of the fall, the parts are found scattered about, being still considerably warm, and most of them entered the earth several inches deep. But their most remarkable character, and that which distinguished them first is that they have a perfect resemblance to one another. They are always different from the neighbouring bodies, and present in every case the same appearance of semimetallic matter, coated on the outside with a thin black encrustation, and bearing strong marks of recent fusion. But besides this, several of these singular substances have been most carefully examined by Proust, Howard, Count de Bournon, Lavoisier, Vauquelin, and others among the most able chemists, and naturalists in Europe, and it has been found that all the substances examined agree very nearly in nature and composition, having the same component materials and in nearly the same proportions: thus the stones examined by Count de Bournon and Mr Howard were found to consist of four distinct substances, viz small metallic substances, a peculiar metallic pyrites, a number of globular and elliptical bodies, also of a peculiar nature, and an earthy cement surrounding the other component parts. The nature of the metallic particles was the same in all, being in each an alloy of iron and nickel. In the pyrites, nickel as well as iron was detected, and the easy decomposition of the pyrites by muriatic acid, afforded a distinguishing character of its substance. The globules contained magnesia, silica, and oxides of nickel and iron. The earthy cement consisted of the same substances nearly in the same proportions. With regard to the actual proportion of these constituents, the celebrated stone which fell at Ensisheim, in Alsace, in 1492, yielded by the analysis of Proust and Vauquelin,

56 0	silica
30 0	oxyd of iron
12 0	magnesia
2 4	nickel
3	sulphur
1 1	lime

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The stones which fell at Lugny, in France, in 1803, yielded to the same philosophers,

54	of silica
36	oxyd of iron
9	magnesia
3	oxyd of nickel
2	sulphur
1	lime

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It likewise appears that the specific gravities of these bodies are such as greatly to exceed all the known ordinary stones, and approach that of metallic ores. Thus, the specific gravity of the Ensisheim stone was 3233, of the

Bezares one, 3352, Sienna, 3352, Cassendi's, 3456; Yorkshirc, 3508, Bachelay's, 3535, the specific gravity of water being assumed 1000. These common and constant characters indicate with strong evidence a common origin. Yet it is necessary to remark that iron is scarcely ever found in the metallic state in terrestrial bodies, volcanic bodies only containing them in the state of oxyd. Nickel is also very rare, being never found on the surface of the earth. Whence it is not unnatural to conclude that aeroliths have in origin foreign to our globe, or at least that they are not produced from phenomena which have been commonly observed. Various hypotheses, therefore, have been devised to account for the origin of these stones. Among others, it has been conceived that they might be projected upon the earth from lunar volcanoes. On subjecting this idea to calculus it has been found that a projectile force quadruple of that usually given to a 12 pounder ball, would be sufficient to carry a body out of the sphere of the moon's influence, so that the terrestrial gravitation would draw it towards our planet. Now, it is not at all improbable that lunar volcanoes might impress such a force upon a body, since terrestrial volcanoes can communicate a much greater impulsion. This opinion acquires a fresh degree of probability from the recent observations of Schroeter upon the moon, with respect to the great height of some of the lunar volcanoes, and the frequent eruptions upon the surface of that globe. It has been ably defended in a curious dissertation by Dr Hutton, in the new abridgement of the Philosophical Transactions, part xxi. Other philosophers think that aeroliths are nothing else than little planets that circulate in space after the manner of the other celestial bodies, and which, when found engaged in the atmosphere of the earth, become inflamed there, by the friction and resistance they experience, lose little by little their velocity, and at length fall to the earth by reason of their heaviness. Mr King, sir William Hamilton and others, consider these stones as concretions actually formed in the atmosphere. But for our own parts, we are at present most inclined to embrace the opinion which ascribes the origin of aeroliths to lunar volcanoes, though, in the present state of our knowledge of these substances and of meteorology, it is not possible to decide. Should any thing be discovered while this work is publishing, that shall tend to throw any better light upon their origin, we mean to resume the subject under the article METEORIC STONES. The inquisitive reader may in the mean while consult Mr Howard's valuable paper in the Philosophical Transactions, for 1802, and the dissertation by Dr Hutton, as above mentioned.

**AEROLOGIA**, (from *aer*, and *logos* a discourse, or discussion.) That part of medical study which treats of air, explains its properties and use in the animal economy, and its efficacy in maintaining or restoring health.

**AEROMANCY**, **AEROMANTIA**, an ancient species of divination, performed by the

means of the air, and phenomena happening therein. The word is compounded of *aer*, air, *metron*, measurement.

**AEROMETRY**, a scientific term, which has now given way to the equivalent term pneumatics.

**AERONAUT**, a person who mounts in an air balloon, and manages it while in the air.

**AERONAUTIC A**, from *aer* and *navitus*, derived from *navis* ship, the art of sailing in a vessel or machine through the atmosphere, sustained as a ship in the sea. See **AEROSTATION**.

**AEROPHOBIA** (from *aer*, and *phobos* terror) A term employed by Caelius Aurlianus to indicate hysteric or phrenitic persons who are fearful of being abroad either in a dark or a lucid atmosphere.

**AEROPHOBIA**, (*αεροφοβία*) the disease to which the aerophobi or aerophobicus are subject.

**ALFA** (α) the 1st letter of the Greek alphabet, and *αλφά*, Gr) The observation of it.

**ALROSTATION** the air balloon, is a name given to a vessel or machine situated between the feet of Cygnus. This constellation was proposed by M. Lalande, in 1798, when he had an interview with M. Borda, Dr Zach, and other German astronomers, at Gotha, whither he was sent to convert them to the French calendar and measures. He did not obtain the object of his mission.

**ALROSTATION**, (formed of *aer*, air, in *αερίον*, of *αερί*, *weight* the science of weights,) in its primary and proper sense, denotes the science of weights, suspended in the air, but in the modern application of the term, it signifies the art of navigating through the air, both in the principles and the practice of it. Hence also the machines, which are employed for this purpose, are called aerostats, or aerostatic machines, and, on account of their round figure, air-balloons. The aeronaut, formed of *aer* and *navitus*, sailor, is the person who navigates through the air by means of such machines.

**Principles of Aerostation** The fundamental principles of this art have been long and generally known, as well as the speculations on the theory of it, but the successful application of them to practice seems to be altogether a modern discovery. These principles chiefly respect the weight or pressure, and elasticity of the air, with its specific gravity, and that of the other bodies to be raised or floated in it. The particular detail of which principles may be seen under the respective words in this dictionary. Suffice it therefore in this place to observe, that any body which is specifically, or bulk for bulk, lighter than the atmosphere, or air encompassing the earth, will be buoyed up by it, and ascend, like as wood, or a cork, or a blown bladder, ascends in water. And thus the body would continue to ascend to the top of the atmosphere, if the air were every where of the same density as at the surface of the earth. But as the air is compressible and elastic, its density decreases continually in

ascending, on account of the diminished pressure of the superincumbent air, at the higher elevations above the earth, and therefore the body will ascend only to such height where the air is of the same specific gravity with itself, where the body will float, and move along with the wind or current of air, which it may meet with at that height. This body then is an aerostatic machine, of whatever form or nature it may be. And an air-balloon is a body of this kind, the whole mass of which, including its covering and contents, and the weights annexed to it, is of less weight than the same bulk of air in which it rises. We know of no solid bodies however that are light enough thus to ascend and float in the atmosphere, and therefore recourse must be had to some fluid or aciform substance. Among these, that which is called inflammable air, the hydrogen gas of the new nomenclature, is the most proper of any that have hitherto been discovered. It is very elastic, and from six to ten or eleven times lighter than common atmospheric air at the surface of the earth, according to the different methods of preparing it. If therefore a sufficient quantity of this kind of air be inclosed in any thin bag or covering the weight of the two together will be less than the weight of the same bulk of common air, and consequently this compound mass will rise in the atmosphere, and continue to ascend till it attain a height at which the atmosphere is of the same specific gravity as itself, where it will remain or float with the current of air, as long as the inflammable air does not escape through the pores of its covering. And this is an inflammable air-balloon. Another way is to make use of common air, rendered lighter by warming it, instead of the inflammable air. Heat, it is well known, rarefies and expands common air, and consequently lessens its specific gravity, and the diminution of its weight is proportional to the heat applied. If therefore the air inclosed in any kind of bag or covering, be heated, and consequently dilated, to such a degree, that the excess of the weight of an equal bulk of common air, above the weight of the heated air, be greater than the weight of the covering and its appendages, the whole compound mass will ascend in the atmosphere, till, by the diminished density of the surrounding air, the whole become of the same specific gravity with the air in which it floats, where it will remain, till, by the cooling and condensation of the included air, it shall gradually contract and descend again, unless the heat is renewed or kept up. And such is a heated air-balloon, otherwise called a Montgolfier, from its inventor. Now it has been discovered, by various experiments, that one degree of heat, according to the scale of Fahrenheit's thermometer, expands the air about one five-hundredth part, and therefore that it will require about 500 degrees, or nearer 484 degrees of heat, to expand the air to just double its bulk, which is a degree of heat far above what is practicable to give it on such occasions. And



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therefore in this respect, common air heated is much inferior to inflammable air, in point of levity and usefulness for aerostatic machines. Upon such principles then depends the construction of the two sorts of air-balloons. But before treating of this branch more particularly, it will be proper to give a short historical account of this late discovered art.

*History of Aerostation.* Various schemes for rising in the air, and passing through it, have been, and are still attempted, both by the ancients and moderns, and that upon different principles and with various success. Of these some attempts have been upon mechanical principles, or by virtue of the powers of mechanism and such are conceived to be the instances related of the flying pigeon made by Archytas, the flying eagle and fly by Regiomontanus, and various others. Again, other projects have been formed for attaching wings to some part of the body, which were to be moved either by the hands or feet, by the help of mechanical powers, so as to strike the air with them, after the manner of the wings of a bird, the person might raise himself in the air, and transport himself through it, in imitation of that animal. The romances of almost every nation have recorded instances of persons being carried through the air, both by the agency of spirits, and mechanical inventions, but till the time of the celebrated lord Bacon, no rational principle appears ever to have been thought of by which this might be accomplished. Friar Bacon indeed had written upon the subject, and many had supposed, that, by means of artificial wings a man might fly as well as a bird; but these opinions were refuted by Borelli in his treatise *De Motu Animalium*, where, from a comparison between the power of the muscles which move the wings of a bird, and those which move the arms of a man, he demonstrates that the latter are utterly insufficient to strike the air with such force as to raise him from the ground. In the year 1672, bishop Wilkins published his "Discovery of the New World, in which he certainly seems to have conceived the idea of raising bodies into the atmosphere by filling them with rarefied air. This however he did not try by any means pursue, but rested his hopes upon mechanical motions to be accomplished by human strength, or by springs, &c. which have been proved incapable of answering any useful purpose. The jesuit Francis Bacon contemporary with bishop Wilkins, proposed to exhaust hollow balls of metal of their air, and by that means occasion them to ascend. But though the theory was unexceptionable, the means were certainly insufficient to the end, for a vessel of copper, made sufficiently thin to float in the atmosphere, would be utterly unable to resist the external pressure which being demonstrated, no attempt was made upon this principle. So that we may reckon nothing to have been particularly concerted towards aerostation, till the experiment of one Guzman a Portuguese friar, who is reported early in the last century to have launched a

paper bag into the air, which, however, soon fell, after attaining the height of 200 feet. Soon after Mr Cavendish's discovery of the specific gravity of inflammable air, it occurred to the ingenious Dr Black of Edinburgh, that if a bladder, sufficiently light and thin, were filled with this air, it would form a mass lighter than the same bulk of atmospheric air, and rise in it. This thought was suggested in his lectures in 1767 or 1768, and he proposed, by means of the distention of a calf, to try the experiment. Other employments, however, prevented the execution of his design. The possibility of constructing a vessel, which, when filled with inflammable air, would ascend in the atmosphere, had occurred also to Mr Cavallo about the same time, and to him belongs the honour of having first made experiments on this subject, in the beginning of the year 1782, of which an account was read to the Royal Society, on the twentieth of June in that year. He tried bladders, but the thinnest of these, however scraped and cleaned, were too heavy. In using Chum piper, he found that the inflammable air passed through its pores, like water through a sieve, and having failed of success by blowing this air into a thick solution of gum, thick varnishes, and oil paint, he was under a necessity of being satisfied with soap-balls, which, being inflated with inflammable air, by dipping the end of a small glass tube, connected with a bladder containing the air, into a thick solution of soap, and gently compressing the bladder, ascended rapidly in the atmosphere, and these were the first sort of inflammable air-balloons that were ever made.

But while aerostation seemed thus on the point of being made known in Britain, it was all at once announced in France, by two brothers, Stephen and John Montgolfier, natives of Annonay, and masters of a considerable paper-manufactory there, who had turned their thoughts to this project as early as the middle of the year 1782. Their idea was to form an artificial cloud, by inclosing smoke in a bag, and making it carry up the covering along with it. In that year, the experiment was made at Avignon with a fine silk bag, and by applying burning paper to an aperture at the bottom, the air was rarefied and the bag ascended to the height of 70 feet. Various experiments were now tried upon a large scale, which excited the public curiosity very greatly. An immense bag of linnen, lined with paper, and containing upwards of 25,000 cubic feet, was found to have a power of lifting about 500 pounds including its own weight. Burning chopped straw and wool under the aperture of the machine, immediately occasioned it to swell, and afterwards to ascend into the atmosphere. In ten minutes it had risen 6000 feet, and when its force was exhausted, it fell to the ground at the distance of 7668 feet from the place it had left. Soon after this, one of the brothers, invited by the Academy of Sciences to repeat his experiments at their expence, constructed a large balloon of an elliptical form. In a preliminary experiment, this machine

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lifted from the ground eight persons who held it, and would have carried them all off if more had not quickly come to their assistance. Next day the machine was filled by the combustion of fifty pounds of straw, and twelve pounds of wool. The machine soon swelled, and sustained it self in the air, together with the charge of between 4 and 500 pounds weight. It was designed to repeat the experiment before the king at Versailles, but a violent storm of rain and wind happening to disturb the machine, it became necessary to prepare a new one, and such expedition was used in it this vast balloon near 60 feet in height and 43 in diameter was made, painted within and without, and finely decorated, in no more than four days and four nights. Along with it was sent a wicker cage containing a sheep, a cock, and a duck, which were the first animals ever sent on such a voyage. The full success of the experiment was however prevented by a violent gust of wind, which tore the machine in two places near the top before it ascended. Still it rose 1440 feet and after remaining in the air about eight minutes, fell to the ground at the distance of 10,700 feet from the place of its setting out. The animal were not in the least hurt.

As the great power of these aerostatic machines, and their very gradual descent, showed they were capable of transporting people through the air with all imaginable safety, M. Pilatre de Rozier offered himself to be the first aerial adventurer in a new machine, constructed in a garden in the faubourg of St Antoine. It was of an oval shape, 48 feet in diameter and 74 in height, and was painted with the signs of the zodiac, and figures of the king's name, and other ornament. A proper gallery, cut &c enabled the person who ascended to supply the fire with fuel, and thus to keep up the machine as long as he pleased. The weight of the whole apparatus was upwards of 1000 pounds. On the 15th of October 1783 M. Pilatre placing himself in the gallery, the machine was inflated and permitted to ascend to the height of 84 feet, where he kept it aloft about four minutes and a half, after which it descended very gently, and such was its tendency to ascend, that it ascended to a considerable height after touching the ground. On repeating the experiment, he ascended to the height of 210 feet. His next ascent was 262 feet, and in the descent, a gust of wind having blown the machine over some huge trees in an adjoining garden, M. Pilatre suddenly extricated himself by throwing straw and wool on the fire, which raised him at once to a sufficient height. On descending again, he once more raised himself to a proper height by the same means. Some time after, he ascended with M. Girond de Villette to the height of 350 feet hovering over Paris at least nine minutes in sight of all the inhabitants, and the machine keeping all the while a steady position. These experiments shewed, that aerostatic machines might be raised or lowered at the pleasure of the persons who ascended. On the 31st of November, 1783, therefore, M. Pilatre and the marquis d'Ar-

landes undertook an aerial voyage, which lasted about 25 minutes, and during which time they passed over a space of above five miles. From the account given by the marquis, they met with several different currents of air, the effect of which was to give a very sensible shock to the machine, and the directions of the motion seemed to be from the upper part downwards. It appears also that they were in some danger of having the balloon burnt altogether, as the marquis observed several round holes made by the fire in the lower part of it, which alarmed him considerably and indeed not without reason. However, the progress of the fire was easily stopped by the application of a wet sponge, and all appearance of danger ceased.

This voyage of M. Pilatre and the marquis may be said to conclude the history of aerostatic machines which are elevated by means of fire, these having been soon after superseded by balloons in which inflammable air was enclosed. This gas, being considerably lighter than heated atmospheric air, possessed many advantages over the other. The first experiment was made by two brothers, Messrs Robert and M. Charles, a professor of experimental philosophy. The bag was composed of lutestring runned over with a solution of the elastic gum, called caoutchouc, and was about 13 English feet in diameter. Many difficulties occurred in filling it with the inflammable air, but being at last set at liberty, after having been well filled, it was 35 pounds lighter than an equal bulk of common air. It remained in the atmosphere only three quarters of an hour, during which it traversed 15 miles. Its sudden descent was supposed to have been owing to a rupture which had taken place when it ascended into the higher regions of the atmosphere. The event of this experiment and the aerial voyage made by Messrs. Rosier and Arlandes naturally suggest the idea of undertaking something of the same kind with a balloon filled with inflammable air. The machine used on this occasion was formed of gores of silk covered with a varnish of caoutchouc, of a spherical figure, and measuring 27½ feet in diameter. A net was spread over the upper hemisphere, and fastened to a hoop, which passed round the middle of the balloon. To this a sort of car was suspended a few feet below the lower part of the balloon, and in order to prevent the bursting of the machine, a valve was placed in it, by opening of which some of the inflammable air might be occasionally let out. The car was of basket work covered with linen, and be suitably ornamented, being 8 feet long 4 broad and 3½ deep its weight 130 pounds. Great difficulties again occurred in filling the machine, but the car at last being removed, the two adventurers took their seats at three quarters after one in the afternoon of the first of December, 1783. At the time the balloon rose, the thermometer stood at 60° of Fahrenheit, and the barometer at 30.18 inches, and, by means of the power of ascent with which they left the ground, the balloon rose till the mercury fell to 27 inches, from

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which they calculated their height to be about 1000 yards. Throwing out ballast occasionally as they found the machine descending by the escape of some of the inflammable air, they found it practicable to keep at pretty near the same distance from the earth during the rest of their voyage, the quicksilver fluctuating between 27 and 27.65 inches, and the thermometer between 53° and 57°, the whole time. They continued in the air an hour and three quarters, and alighted at the distance of 27 miles from Paris, having suffered no inconvenience during their voyage, nor experienced any contrary currents of air, as had been felt by Messrs Pilatre and Arlandes. As the balloon still retained a great quantity of inflammable gas, M. Charles determined to take another voyage by himself. M. Robert accordingly got out of the machine, which now being 130 pounds lighter, arose with such velocity, that in twenty minutes he was almost 4000 feet in the air, and entirely out of sight of terrestrial objects. The globe, which had been rather flaccid, soon began to swell, and the inflammable air escaped in great quantity. He also drew the valve, to prevent the balloon from bursting, and the inflammable gas, being considerably warmer than the external air, diffused itself all round, and was felt like a warm atmosphere. In ten minutes, however, the thermometer indicated a great variation of temperature: his fingers were benumbed with cold, and he felt a violent pain in his right ear and jaw, which he ascribed to the expansion of the air in these organs as well as to the external cold. The beauty of the prospect which he now enjoyed, however, made amends for the inconveniences. At his departure the sun was set on the valleys, but the height to which M. Charles was got in the atmosphere rendered him again visible, though only for a short time. He saw, for a few seconds, vapours rising from the valleys and rivers. The clouds seemed to ascend from the earth, and collect one upon the other, still preserving their usual form, only their colour was grey and monotonous for want of sufficient light in the atmosphere. By the light of the moon, he perceived that the machine was turning round with him in the air, and he observed that there were contrary currents which brought him back again. He observed also, with surprise, the effects of the wind, and that the streamers of his banners pointed upwards, which, he says, could not be the effect either of his ascent or descent, as he was moving horizontally at the time. At last, recollecting his promise of returning, to his friends in half an hour, he pulled the valve, and accelerated his descent. When within 200 feet of the earth, he threw out two or three pounds of ballast, which rendered the balloon again stationary, but, in a little time afterwards, he gently alighted in a field about three miles distant from the place whence he set out, though, by making allowance for all the turnings and windings of the voyage, he supposed that he had gone through nine miles at least. By the calculations made, it appears that he rose

at this time not less than 10,500 feet; a height somewhat greater than that of Mount Ætna.

The subsequent aerial voyages differ so little from that just now related, that any particular description of them seems to be superfluous. It had occurred to M. Charles, however, in his last flight, that there might be a possibility of directing the machine in the atmosphere, and this was afterwards attempted by M. Jean-Pierre Blanchard. In one of the aerostatic excursions of the latter, he gives an account of the sensations he felt during his voyage, and which were somewhat different from those of M. Charles, having in one part of it found the atmosphere very warm, in another cold, and having once found himself very hungry, and at another time almost overcome by a propensity to sleep. The height to which he rose, as measured by mathematical instruments, was thought to be very little less than 10,000 feet, and he remained in the atmosphere an hour and a quarter. Notwithstanding the rapid progress of aerostation in France, it is remarkable that we have no authentic account of any experiments of this kind being attempted in other countries. Even in our own island, where all arts and sciences find an indulgent nursery, and many their birth, no aerostatic machine was seen before the month of November 1783. Various speculations have been made on the reasons of this strange neglect of so novel and brilliant an experiment, but none seemed to carry any shew of probability, except that it was said to be discouraged by the leader of a philosophical society, expressly instituted for the improvement of natural knowledge, for the reason, as was said, that it was the discovery of a neighbouring nation. Be this however as it may, it is a fact that the first aerostatic experiment was exhibited in England, by a foreigner unconnected and unsupported. This was a count Zambecani, an ingenious Italian, who happened to be in London about that time. He made a balloon of oiled silk, 10 feet in diameter, weighing only 11 pounds, it was gilt, both for ornament, and to render it more impermeable to the inflammable air with which it was to be filled. The balloon, after being publicly shewn for several days in London, was carried to the Artillery-ground, and there being filled about three-quarters with inflammable air, and having a direction inclosed in a tin box for any person by whom it should afterwards be found, it was launched about one o'clock on the 25th of November, 1783. At half past three it was taken up near Petworth in Sussex, 48 miles distant from London, so that it travelled at the rate of near 20 miles an hour. Its descent was occasioned by a rent in the silk, which must have been the effect of the rarefaction of the inflammable air when the balloon ascended to a rarer part of the atmosphere. The attempts of M. Blanchard to direct his machine through the atmosphere, were repeated in 1784, by Messrs Merveau and Bertrand, at Dijon, who raised themselves with an inflammable air-balloon to the height, as it was

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thought, of 13,000 feet passing through a space of 18 miles in an hour and 25 minutes. M. Morveau had prepared oars for directing the machine through the air, but they were damaged by the wind, so that only two remained serviceable, by working these, however, they were able to produce a sensible effect on the motion of the machine. In a third aerial voyage performed by M. Blanchard, he seemed to produce some effect by the agitation of his wings, both in ascending, descending, moving sideways, and even in some measure against the wind; however this is supposed, with some probability, to have been a mistake, as, in all his succeeding voyages, the effects of his machinery could not be perceived.

Having said thus much with regard to the conducting aerostatic machines through the atmosphere, we shall now relate the attempts made to lessen their expence, by falling upon some contrivance to ascend without throwing out ballast, and to descend without losing any of the inflammable air. The first attempt of this kind was made by the duke de Chartres, who, on the 15th of July 1784, ascended with the two brothers, Charles and Robert, from the park of St. Cloud. The balloon was of an oblong form, made to ascend with its longest diameter horizontally, and measured 55 feet in length and 24 in breadth. It contained within it a smaller balloon filled with common air, by blowing into which with a pair of bellows, and thus throwing in a considerable quantity of common air, it was supposed that the machine would become sufficiently heavy to descend, especially as, by the inflation of the internal bag, the inflammable air in the external one would be condensed into a smaller space, and thus become specifically heavier. The voyage, however, was attended with such circumstances as rendered it impossible to know what would have been the event of the scheme. The power of ascent with which they set out seems to have been very great, as in three minutes after parting from the ground, they were lost in the clouds, and involved in such a dense vapour that they could neither see the sky nor the earth. In this situation they seemed to be attacked by a whirlwind which, besides turning the balloon three times round from right to left, shocked and beat it so about, that they were rendered incapable of using any of the means proposed for directing their course, and the silk stuff of which the helm had been composed was even torn away. No scene can be conceived more terrible than that in which they were now involved. An immense ocean of shapeless clouds rolled one upon another below them, and seemed to prevent any return to the earth, which still continued invisible, while the agitation of the balloon became greater every moment. In this extremity they cut the cords which held the interior balloon, and of consequence it fell down upon the aperture of the tube that came from the large balloon into the boat, and stopped it up. They were then driven upwards by a gust of wind from below, which carried

them to the top of that stormy vapour in which they had been involved. They now saw the sun without a cloud, but the heat of his rays, with the diminished density of the atmosphere, had such an effect on the inflammable air, that the balloon seemed every moment ready to burst. To prevent this they introduced a stick through the tube, in order to push away the inner balloon from its aperture, but the expansion of the inflammable air pushed it so close, that all attempts of this kind proved ineffectual. It was now, however, become absolutely necessary to give vent to a very considerable quantity of the inflammable air, for which purpose the duke de Chartres himself bored two holes in the balloon, which tore open for the length of seven or eight feet. On this they descended with great rapidity, and would have fallen into a lake, had they not hastily thrown out 60 pounds of ballast, which enabled them just to reach the water's edge. This scheme for raising or lowering aerostatic machines by bags filled with common air being thus rendered dubious, another method was thought of. This was to put a small aerostatic machine with rarefied air under an inflammable air balloon, but at such a distance that the inflammable air of the latter might be perfectly out of the reach of the fire used for inflating the former, and thus, by increasing or diminishing the fire in the small machine, the absolute weight of the whole would be considerably diminished or augmented. This scheme was unhappily put in execution by the celebrated M. Pilatre de Rozier and M. Romaine. Their inflammable air-balloon was about 37 feet in diameter, and the power of the rarefied air once was equivalent to about 60 pounds. They ascended without any accident, but had not been long in the atmosphere when the inflammable air balloon was seen to swell very considerably, at the same time that the crochets were observed by means of telescopes, very anxious to get down and busied in pulling the valve and opening the appendages to the balloon, in order to facilitate the escape of as much inflammable air as possible. Shortly after this the machine took fire, at the height of about three quarters of a mile from the ground. No explosion was heard, and the silk of the balloon seemed to resist the atmosphere for about a minute, after which it collapsed, and descended along with the two unfortunate travellers so rapidly, that both of them were killed. Pilatre seemed to have been dead before he came to the ground, but M. Romaine was alive when some persons came up to him, though he expired immediately after.

The first aerial voyage in England was performed on the 15th of September 1784, by Vincent Lunardi, a native of Italy. His balloon was made of oiled silk, painted in alternate stripes of blue and red. Its diameter was thirty-three feet. From a net which went over about two-thirds of the balloon descended forty-five cords to a hoop hanging below the balloon, and to which the gallery was attached. The balloon had no valve, and its neck, which

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terminated in the form of a pear, was the aperture through which the inflammable air was introduced, and through which it might be let out. The air for filling the balloon was produced from zinc by means of diluted vitriolic acid. Mr Lunardi departed from the Artillery-ground at two o'clock, and with him were a dog, a cat, and a pigeon. After throwing out some sand to clear the houses, he ascended to a great height. The direction of his motion at first was NW by W, but as the balloon rose higher, it fell into another current of air which carried it nearly N. About half after three he descended very near the ground and landed the cut, which was almost dead with cold. Then rising, he prosecuted his voyage. He ascribes his descent to the action of an oar, but as he was under a necessity of throwing out ballast in order to re-ascend, his descent was more probably occasioned by the loss of inflammable air. At ten minutes past four he descended on a meadow near Ware in Hertfordshire. The only philosophical instrument which he carried with him was a thermometer, which in the course of his voyage stood as low as 29°, and he observed that the drops of water collected round the balloon were frozen.

The second aerial voyage in England was performed by Mr Blanchard and Mr Sheldon, professor of anatomy to the Royal Academy, being the first Englishman who ascended with an aerostatic machine. They ascended at Chelsea the 16th of October at 9 minutes past 12 o'clock. Mr Blanchard having landed Mr Sheldon at about 14 miles from Chelsea, re-ascended alone, and finally landed near Runsey in Hampshire about 75 miles distant from London having gone nearly at the rate of 20 miles an hour. The wings used on this occasion it seems produced no deviation from the direction of the wind. Mr Blanchard said that he ascended so high as to feel a great difficulty of breathing, and that a pigeon, which flew with him from the boat laboured for some time to sustain itself with its wings in the rarefied air, but after wandering a good while, returned, and rested on the side of the boat.

On the 4th of October Mr Smeaton, an ingenious tradesman at Oxford, ascended at that place with an inflammable air balloon of his own construction and filling. And again on the 12th of the same month he ascended at Oxford and floated to the distance of 14 miles in 17 minutes, which is at the rate of near 50 miles an hour. On the 23d of March count Zambecco, and admiral sir Edward Vernon ascended at London and sailed so Hounslow in Sussex, at the distance of 35 miles in less than an hour. The voyage proved very dangerous, owing to some of the machinery about the valve being damaged, which obliged them to cut open some part of the balloon when they were about two miles perpendicular height above the earth, the barometer having fallen for 1 1/2 inches. In the evening they passed through a dense cloud, which felt very cold, and covered them with snow. The observations they made were, that the

balloon kept perpetually turning round its vertical axis, sometimes so rapidly as to make each revolution in four or five seconds, that a peculiar noise, like rustling, was heard among the clouds, and that the balloon was greatly agitated in the descent. Perhaps the most daring attempt was that of Mr Blanchard and Dr Jeffries, across the straits of Dover. This took place on the 7th of January 1785, being a clear frosty morning, with a wind, barely perceptible, at NNW. The operation of filling the balloon began at ten o'clock and at three quarters after twelve every thing was ready for their departure. At one o'clock Mr Blanchard desired the boat to be pushed off, which now stood only two feet distant from that precipice so finely described by Shakespeare in his tragedy of King Lear. As the balloon was scarcely sufficient to carry two, they were obliged to throw out all their ballast except three bags of ten pounds each, when they at last rose gently, though making very little way on account of there being so little wind. At a quarter after one o'clock, the barometer which on the cliff stood at 29.7 inches, was now fallen to 27.3 and the weather proved fine and warm. They had now a most beautiful prospect of the south coast of England, and were able to count 37 villages upon it. After passing over several vessels they found that the balloon, at 30 minutes after one, was descending on which they threw out a sack and in half of ballast, but as they saw that it still descended and that with much greater velocity than before they now threw out all the ballast. This still proving insufficient, they next threw out a parcel of books they carried along with them, which made the balloon ascend when they were about midway between France and England. At a quarter past two finding themselves again descending, they threw away the remainder of their books, and ten minutes after they had almost enchanted prospect of the French coast. Still, however, the machine descended, and as they had now no more ballast, they were fain to throw away their provisions for eating, the wings of their boat and every other moveable they could easily spare. "We threw away," says Dr Jeffries, "our only bottle, which in its descent cast out a steam like smoke, with a rushing noise, and when it struck the water, we heard and felt the shock very perceptibly on our ear and balloon." All this proving insufficient to stop the descent of the balloon, they next threw out their anchors and cords and at last ripped off their clothes, fastening themselves to certain slings, and intending to cut away the boat as their last resource. They had now the satisfaction, however, to find that they were rising, and as they passed over the high lands between Cape Blanc and Calais, the machine rose very fast, and carried them to a greater height than they had been in any former part of their voyage. They descended safely among some trees in the forest of Gruennes, where there was just opening enough to admit them.

In September 1785, Mr Baldwin ascended

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from Chester, in Mr Inwards's balloon, and after traversing in a variety of directions, he first alighted in the neighbourhood of Frodsham, then re-ascending and pursuing his excursion, he finally landed at Rixton Moss, twenty-five miles from Chester. Mr Baldwin, who published his observations made during the voyage, and taken from minutes, mentions the following curious particulars. The sensation of ascending he compares to a strong pressure from the bottom of the car upwards against the soles of his feet. At the distance of what appeared to him seven miles from the earth, though by the barometer scarcely a mile and a half, he had a grand and most enchanting view of the city of Chester and its adjacent places below him. The river Dee appeared of a red colour, the city very diminutive, and the town entirely blue. The whole appeared a perfect plain, the highest building having no apparent height, but reduced all to the same level, and the whole terrestrial prospect appeared like a coloured map. The perspective appearance of things to him was very remarkable. The lowest bed of vapour that first appeared as cloud was pure white in detached fleeces, increasing as they rose they presently coalesced and formed, as he expresses it, a sea of cotton, tufting here and there by the action of the air in the undisturbed part of the clouds. The whole became an extended white floor of cloud, the upper surface being smooth and even. Above this white floor he observed at great and unequal distances, vast assemblages of thunder clouds, each parcel consisting of whole acres in the densest form. He compares their form and appearance to the mook of pieces of ordnance which had consolidated as it were into masses of snow and penetrated through the upper surface, or white floor of common clouds, their remaining visible and at rest. He endeavoured to convey some idea of the scene by a sketch, for which see pl. 1. Aerostation fig. 2. It represents a circular view he had from the car of the balloon, himself being over the centre of the view, looking down on the white floor of clouds and seeing the city of Chester through an opening, which discovered the landscape below limited by surrounding vapour to less than two miles in diameter. The breadth of the outer margin defines his apparent height in the balloon (*viz.* four miles) above the white floor of clouds. The regions in which he was did not feel colder, but rather warmer, than below, and the sun felt hottest when the balloon was stationary. The discharge of a cannon when the balloon was at a considerable height, was distinctly heard, and another discharge when he was at the height of thirty yards, so disturbed him as to oblige him for safety to lay hold firmly of the cords of the balloon.

Omitting the relation of Mr Crosbie's attempt to cross the Irish channel, and of major Mooney's narrow escape from drowning in the German ocean, we proceed to remark that, about the latter end of August 1785, the longest

aerial voyage we have yet heard of was performed by Mr Blanchard. He ascended at Isle, accompanied by the chevalier de L'Ipi-nard, and travelled 300 miles in the balloon before it descended. On this occasion, as on some former ones, Mr Blanchard made trial of a parachute, an instrument like a large umbrella invented to break the fall, in case of an accident happening to the balloon. With this machine he dropped a dog from the car soon after his ascension, which descended gently and unhurt. The most celebrated aeronaut of the present day is citizen Garnerin, a man of a confident and ingenious mind, but probably not very intimately acquainted with the sciences connected with aerostation. We do not remember hearing of this gentleman until August 1798, on the 28th of which month he made his eleventh excursion from Paris, accompanied by a friend citizen Henry. His course for a considerable time was near the ground, during which he conversed with the people below. These conversations shewed how much the earth reflected sound, for all his words were repeated five or six times. He thought at first that it might be governed by some local circumstances, which indeed is very probable with regard to the repetition. He descended several times to the same level, at distances of ten leagues asunder, where he constantly observed the same effect. This great vibration of the air was not sensible to distance exceeding 150 or 200 toises. It decreased with the distance. Having made a number of aerial voyages, M. Garnerin's mechanical acquaintance with the requisites for insuring success was confirmed by frequent experience. This gentleman, valuing himself of the short interval of peace, visited England in the summer of 1802, and thus excited the attention of the British public to the almost forgotten subject of aerostation. His voyages made in this country are fresh in the memory of every one, and as they were minutely detailed in several daily papers and monthly publications, we shall be the more readily excused giving a full account of them here. On June 29th, this aeronaut accompanied by a military gentleman (captain Sowden) rose from Ramsligh, and alighted near Colchester, in less than three quarters of an hour, having in that short period travelled full 60 miles! During this voyage the aeronauts did not appear to move with any unpleasant rapidity, until they began to descend, when they were much affected by the boisterousness of the wind. Their descent was attended with danger, and occupied some minutes. From this voyage, then, it may fairly be concluded that the wind often moves with much greater velocity than is commonly assigned to it. On the day this voyage was made, the wind was not thought to be more high and boisterous than it often is, yet it can hardly be doubted that its velocity was more than 80 miles per hour, and this is nearly double the velocity which is commonly assigned to such winds. See WIND.

The singular experiment of ascending into the

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atmosphere with an inflammable-air balloon, and of descending with a machine called a parachute, was performed by M Garnerin on the 21st of September 1802. He ascended from St Georges Parade, North Audley-street, and descended safe into a field near the small-pox hospital at Pancras. The balloon was of the usual sort, viz of oiled silk, with a rib, from which ropes proceeded, which terminated in, or were joined to, a single rope at a few feet below the balloon. To this rope the parachute was fastened in the following manner. The reader may easily form to himself an idea of this parachute, by imagining a large umbrella of canvas of about thirty feet in diameter, but destitute of the ribs and handle. Several ropes of about thirty feet in length, which proceeded from the edge of the parachute, terminated in a common joining, from which shorter ropes proceeded, to the extremities of which a circular basket was fastened, and in this basket M Garnerin placed himself. Now the single rope, which has been said above to proceed from the balloon, passed through a hole in the centre of the parachute, also through certain tin tubes, which were placed one after the other in the place of the handle or stick of an umbrella, and was lastly fastened to the basket, so that when the balloon was in the air, by cutting the end of this rope next to the basket, the parachute, with the basket, would be separated from the balloon, and, in falling downwards, would be naturally opened by the resistance of the air. The use of the tin tubes was to let the rope slip off with greater certainty, and to prevent its being entangled with any of the other ropes, as also to keep the parachute at a distance from the basket. The balloon began to be filled at about two o'clock. There were thirty-six casks filled with iron filings and diluted sulphuric acid, for the production of the hydrogen gas. These communicated with three other casks or general receivers, to each of which was fixed a tube that emptied itself into the main tube attached to the balloon. At six, the balloon being quite full of gas, and the parachute, &c. being attached to it, M Garnerin placed himself in the basket, and ascended majestically amidst the acclamations of innumerable spectators. The weather was the clearest and pleasantest imaginable, the wind was gentle and about west by south, in consequence of which M Garnerin went in the direction of about east by north. In about eight minutes time, the balloon and parachute had ascended to an immense height, and M Garnerin, in the basket, could scarcely be perceived. While every spectator was contemplating the grand sight before them, M Garnerin cut the rope, and in an instant he was separated from the balloon, trusting his safety to the parachute. At first, viz before the parachute opened, he fell with great velocity, but as soon as the parachute was expanded, which took place a few moments after, the descent became very gentle and gradual. In this respect a remarkable circumstance was

observed, namely, that the parachute with the appendage of cords and basket, soon began to vibrate like the pendulum of a clock, and the vibrations were so great, that more than once the parachute, and the basket with M Garnerin, seemed to be on the same level, or quite horizontal, which appeared extremely dangerous; however, the extent of the vibrations diminished as he came pretty near the ground. On coming to the earth, M Garnerin experienced some pretty strong shocks, and when he came out of the basket, he was much discomposed, but he soon recovered his spirits, and remained without any material hurt.

**A F R O S T A T I O N, P R A C T I C E O F** The shape of the balloon is one of the first objects of consideration in the construction of this machine. As a sphere admits the greatest capacity under the least surface, the spherical figure or that which approaches nearest to it, has been generally preferred. However, since bodies of this form oppose a great surface to the air, and consequently a greater obstruction to the action of the oar or wings than those of some other form, it has been proposed to construct balloons of a conical or oblong figure, and to make them proceed with their narrow end forward. Some have suggested the shape of a fish, others, that of a bird; but either the globular, or the egg-like shape, is, all things considered, certainly the best which can be adopted. The bag or cover of an inflammable-air balloon is best made of the silk stuff called lustring, varnished over. But for a Montgolfier, or heated-air balloon, on account of its great size, linen cloth has been used, lined within or without with paper, and varnished. Small balloons are made either of varnished paper, or simply of paper unvarnished, or of gold-beaters skin, or such-like light substances. The best way to mix up the whole coating of the balloon, is by different pieces or slips joined lengthways from end to end, like the pieces composing the surface of a geographical globe, and contained between one meridian and another, or like the slices into which a melon is usually cut, and supposed to be spread flat out. Now the edges of such pieces cannot be exactly described by a pair of compasses, not being circular, but flatter or less round than circular arches, but if the slips are sufficiently narrow, or numerous, they will differ the less from circles, and may be described as such. But more accurately, the breadths of the slip, at the several distances from the point, to the middle, where it is broadest, are directly as the sines of those distances, radius being the half length of the slip. After providing the necessary quantity of the stuff, and each piece having been properly prepared with the drying oil, let the corresponding edges be sewed together in such a manner as to leave about half or three quarters of an inch of one piece beyond the edge of the other, in order that this may, in a subsequent row of stitches, be turned over the latter, and both again sewed down together by so doing, a considerable degree of strength is



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given to the whole bag at the seams, and the hazard of the gas escaping doubly prevented. Having gone in this manner through all the seams, the following method of Mr Blanchard is admirably calculated to render them yet more perfectly air-tight. The seam being doubly stitched as above, lay beneath it a piece of brown paper, and also another piece over it on the outside, upon this latter pass several times a common fire-iron heated just sufficiently to soften the drying oil in the seam; this done, every interstice will be now closed, and the seam rendered completely air-tight. The neck of the balloon being left a foot in diameter and three in length, and all the seams finished, the bag will be ready to receive the varnish, a single coating of which on the outside is found preferable to the former method of giving an internal as well as external coat.

The compositions for varnishing balloons have been variously modified, but, upon the whole, the most approved appears to be the bird-lime varnish of M. Faujas St. Fond, prepared after Mr Cavallo's method is follows. "In order to render linseed oil drying, boil it, with two ounces of sugar of lead and three ounces of litharge for every pint of oil, till they are dissolved, which may be in half an hour. Then put a pound of bird lime and half a pint of the drying oil into an iron or copper vessel whose capacity should equal about a pailon, and let it boil very gently over a slow charcoal fire, till the bird-lime ceases to crackle, which will be in about half or three-quarters of an hour; then pour upon it two pints and a half more of the drying oil, and let it boil about an hour longer, stirring it frequently with an iron or wooden spatula. As the varnish whilst boiling, and especially when nearly done, swells very much, care should be taken to remove in those cases the pot from the fire, and replace it when the varnish subsides; otherwise it will boil over. Whilst the stuff is boiling the operator should occasionally examine whether it has boiled enough, which may be known by observing whether, when rubbed between two knives and then separated from one another, the varnish forms threads between them, as it must then be removed from the fire. When nearly cool, add about an equal quantity of spirit of turpentine in using the varnish, the stuff must be stretched and the varnish lukewarm in twenty-four hours it will be dry." As the elastic resin, known by the name of Indian rubber, has been much extolled for a varnish, the following method of making it, as prescribed by Mr Blanchard, may not prove unacceptible. Dissolve elastic resin, cut small, in five times its weight of rectified essential oil of turpentine, (etheral spirit of turpentine of the shops), by keeping them some days together, then boil one ounce of this solution in eight ounces of drying linseed oil for a few minutes, strain the solution, and use it warm. The car or boat is best made of wicker-work, covered with leather, and painted, and the proper method of suspending it, is by ropes proceeding from the

net which goes over the balloon. This net should be formed to the shape of the balloon, and fall down to the middle of it, with various cords proceeding from it to the circumference of a circle about two feet below the balloon, and from that circle other ropes should go to the edge of the boat. This circle may be made of wood, or of several pieces of kinder cane bound together. The meshes of the net may be small at top, against which part of the balloon the inflammable air exerts the greatest force, and increase in size as they recede from the top.

With regard to the rarefied-air machines, Mr Cavallo recommends first to soak the cloth in a solution of sal ammoniac and common size, using one pound of each to every gallon of water, and when the cloth is quite dry, to paint it over in the inside with some earthy colour, and strong size or glue. When this paint has dried perfectly, it will then be proper to varnish it with oily varnish, which might dry before it could penetrate quite through the cloth. Simple drying linseed oil will answer the purpose as well as any, provided it be not very fluid. If a parachute is required it should be constructed so as when distended to form but a small segment of a sphere, and not a complete hemisphere, as the weight of this machine is otherwise considerably increased, without gaining much in the opposing surface. The parachute of M. Garnerin is particularly defective in a too great extension of its diameter, an unnecessary addition to its weight of a lining of paper both withinside and without, the too near approximation of the basket to the body of the parachute, and especially in the want of a perpendicular cord passing from the car to the centre of the concave of the umbrella, by the absence of which the velocity of the descent is certain to be very rapid before the machine becomes at all distended, whereas, if a cord were thus disposed, the centre of the parachute would be the portion first drawn downwards by the appended weight, and the machine would be almost immediately at its full extension. Having found, by experiment, the diameter required for insuring safety, the further the basket or car is from the umbrella the less fear shall we have of an invasion of the whole from violent oscillations, yet the longer the space between the car and the head of the machine the longer will be the space run through in each vibration when once begun, yet by so much the more will they be staidier, and this ought to be attended to, as when by the violence of the oscillations the car became (in Garnerin's experiment) on a line with the horizontal axis of the machine (or, in other words, the point of suspension), the force of gravity, or the gravitating power of the weight in the car, on the umbrella, being at that crisis reduced to nothing, the slightest cause might have carried the body of the machine in a lateral direction, reversing the concavity of the umbrella, and M. Garnerin, perhaps, have fallen upon the now convex yet internal portion of the bag, and the whole have descended



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confusedly together —It now remains to give some account of the method by which aerostatic machines may be filled, and here we are able to determine with much greater precision concerning the inflammable-air balloons than the other kind. With regard to these, a primary consideration is, the most effectual and cheap method of procuring the inflammable air. It will be found that the most advantageous methods are, by applying acids to certain metals, by exposing animal, vegetable and some mineral substances, in a close vessel to a strong fire or lastly, by transmitting the vapour of certain fluids through red hot tubes. For obtaining inflammable air from pit coal, asphaltum, amber, &c &c Mr Cavallo recommends the following apparatus. Let a vessel be made of clay, or rather of iron in the shape of a Florence flask, somewhat larger, and whose neck is longer and larger ABC, (fig. 5.) Put the substance to be used into this vessel, so as to fill about four-fifths or less of its cavity AB. If the substance be of such a nature as to swell much by the action of the fire, lute a tube of brass, or first brass and then a leaden tube, to the neck C of the vessel, and let the end D of the tube be shaped as in the figure, so that going into the water HI, it may terminate under a sort of inverted vessel EF, to the upper aperture of which the balloon G is adapted. Things thus prepared, if the part AB of the vessel is put into the fire, and made red hot, the inflammable air produced will come out of the tube CD, and passing through the water will at last enter into the balloon G. Previous to the operation, as a considerable quantity of common air remains in the inverted vessel EF which it is more proper to expel the vessel EF should have a stop cock K through which the common air may be sucked out, and the water ascend as high as the stop cock. To procure inflammable air by means of steam Dr Priestley uses a tube of red-hot brass, upon which the steam of water has no effect and which he fills with the turnings of iron that are separated in the boring of cannon. By this means he obtains an inflammable air, the specific gravity of which is to that of common air as 1 to 1. In this method, not yet indeed reduced to general practice, a tube about three quarters of an inch in diameter, and about three feet long is filled with iron turnings, then the neck of a retort, or close boiler, is luted to one of its ends, and the worm of a refrigerator is adapted to its other extremity. The middle part of the tube is then surrounded with burning coals, so as to keep about one foot in length of it red hot, and a fire is always made under the retort or boiler sufficient to make the water boil with vehemence. In this process a considerable quantity of inflammable air comes out of the refrigerator. It is said that iron yields one half more air by this means than by the action of vitriolic acid. —With regard to the rarefied-air balloons, the method of filling them is by means of a scaffold, the breadth of which is at least two-thirds of the diameter of the machine, and ele-

vated about six or eight feet above the ground. From the middle of it descends a well, rising about two or three feet above it, and reaching to the ground, furnished with a door, through which the fire in the well is supplied with fuel. The well should be constructed of brick, and its diameter somewhat less than that of the machine. On each side of the scaffold are erected two masts, each of which is fixed by ropes, and has a pulley at the top. The machine is to be placed on the scaffold, with its neck round the aperture of the well. The rope passing over the pulleys of the two masts, serves to lift the balloon about fifteen feet above the scaffold and it is kept steady, and held down, whilst filling, by ropes passing through loops or holes about its equator and these ropes may easily be disengaged from the machine, by slipping them through the loops when it is able to sustain itself. The proper combustibles to be lighted in the well are those which burn quick and clear rather than such as produce much smoke, because it is hot air, and not smoke, that is required. Small wood and straw are very fit for this purpose. As the current of hot air ascends the machine will dilate, and lift it if above the scaffold and gallery which was covered by it. The passengers fuel instruments, &c are then placed in the gallery. When the machine makes efforts to ascend, its aperture must be brought, by means of the ropes annexed to it, towards the side of the well a little above the scaffold, the fire place is then suspended in it, the fire lighted in the grate and the lateral ropes being slipped off, the machine is let go. It has been determined by accurate experiments, that only one-third of the common air can be expelled from these large machines, and therefore the ascending power of the rarefied air in them can be estimated as only equal to half an ounce weighty measure for every cubic foot.

The conduct of balloons when constructed, filled, and actually ascending in the atmosphere, is an object of great interest in the practice of aerostation. The method generally used for directing or lowering the balloons with rarefied air has been the increase or diminution of the fire, and this is entirely at the command of the aeronaut, as long as he has any fuel in the gallery. The inflammable-air balloons have been generally raised or lowered by diminishing their ballast, or by letting out some of the gas through the valve but the alternate escape of the air in descending, and discharge of the ballast for ascending, will by degrees render the machine incapable of floating, for in the air it is impossible to supply the loss of ballast, and very difficult to supply that of inflammable air. These balloons will also rise or fall by means of the rarefaction or condensation of the inclosed air, occasioned by heat and cold, as has been already observed. Wings or oars are the only means of this sort that have been used with any probable success, and, as Mr Cavallo observes, they seem to be capable of considerable improvement, though much is not to

be expected from them, when the machine goes at a great rate. It is a matter of surprise, that the various hints for directing balloons appear to lie dormant with their projectors, who seem indisposed to make any attempts to carry their plans into execution: thus the inventions of Professor Danzel (*Philosophical Magazine*, vol. iv.), also of Martin, and the proposals for performing the same by means of eagles trained for the purpose, or by a reversed parachute to retard the direct progress of the balloon, whereby less power will be necessary to impel it in a lateral direction, all these plans remain obsolete and unpractised from the time of their suggestion. With respect to the probability of directing acrostatic machines, we may infer it to be possible, although the methods hitherto tried have been inadequate, perhaps because they were not sufficiently powerful as to expect to make so large a body as a balloon to vary from the wind by the impulsion of an oar of six or eight feet in length and one or two in breadth (and that by only endeavouring to draw the air out of the perpendicular), is to expect, by means of a boat's oar, to impel a ship of burthen. Oars are doubtless the most likely means to effect this purpose, if they were of dimensions proportionate to the effects they are wished to produce. The addition of sails, where any variation from the wind is desired, will prove injurious till we have attained a method (perhaps only to be accomplished by oars) of keeping the same point of the balloon continually in a given direction. Yet we doubt not but these also might prove of great service in quick dispatches by water, as for instance, where it is required to press a fortress or fleet for the succour of a besieged town, or convey dispatches thereto: a small balloon of ten or twelve feet diameter provided with sails to expose a large surface to the wind being attached by a long rope to a boat, would outstrip the quickest vessel, and might also be made to deviate from the course of the wind as the water would form a counter-resisting medium, the want of which in air balloons occasions the difficulty of steering them. A sail balloon similar to the above might also be advantageously attached to a land-carriage, namely, by increasing the capacity of the balloon so that its power of ascension being nearly equal to the weight of the appendage carriage the latter would be drawn along by the impulsion of the wind against the balloon and sails, while the friction over the ground, by the small overplus weight, may be reasonably expected to afford a resistance sufficient to guide the machine, and allow of a deviation in the carriage of at least eight points from the course of the wind. Indeed the uses of the art of aerostation, even in its present incomplete state, may be very considerable. Air balloons may serve the purpose of escaping from ships that cannot safely land, from besieged places, and from other circumstances of danger. They also expedite the communication of important events by signals, and serve for exploring from

a great elevation adjacent coasts or regions, fleets and armies. Thus, the French ascribe to the elevation of a balloon, and the information obtained in consequence of thus reconnoitring the army of the enemy, the signal victory gained in the battle of Fleurus in 1794. Balloons may likewise serve to explore and ascertain the nature of the air in the higher regions of the atmosphere. One of the finest experiments made on this point is that of Gay-Lussac, who, being elevated in a balloon to the height of 6900 metres (nearly eight miles), the greatest ever attained by any person, brought some atmospheric air from those regions which, on being analysed, was found to furnish the principles of oxygen, azote, hydrogen, and carbonic acid gas, in the same proportions as at the surface of the earth. Balloons would also enable us to determine the changes in the direction of winds at different altitudes, and the law of the diminution of heat at different elevations. In fact, the application of these machines to the advancement of our knowledge of the various phenomena in meteorology, stands prominent, as the, perhaps only means of increasing our acquaintance with causes yet known only by their effects. Their use will also be indicated in many urgent cases where other means of conveyance might fail short. At the same time we conclude with remarking, that the hitherto unsuccessful attempts to render aerial navigation of service to mankind, ought to furnish no argument for causing it to be discouraged by men of sense, or prohibited by civil authority. Many arts and sciences from which commercial nations now derive so much benefit were long, in requiring to maturity, and were only at length produced for the public good, in consequence of patient investigation and reiterated experiments. Much useful information on the theory and practice of aerostation may be obtained from Baldwin's *Aeropaedia*, Cavallo on *Aerostation*, and *Description des Expériences Aérostiques* par M. Tulas St Fond. See also *Phil Mag* nos 50, 56, 57, &c.

**AIRVA** in botany, a genus of the monadelphia decandria class and order, and which, according to L. Murr., bears affinity to the *amaranthus*.

**ÆRUCA** (*arugo*) Verdigrise

**ÆRUGINOSUS** (*æruginosus*) Green, verdigrise colour

**ÆRUGO** (from *æro*, air or ether, because of its bluish colour, or because rust is contracted by the air) The rust of any metal, and particularly of copper. Verdigrise

**ÆRUGO-ÆRIS** (from *ærogo*, and *æris*, copper) Rust of copper. Verdigris

**ÆRUGO PRÆPARATA** Prepared verdigris. It is much esteemed as an escharotic, and is, on this account, the basis of the unguentum *æruginis*, pharm. Lond. In the new chemical nomenclature, prepared verdigris is termed oxydum cupri viride per acidum acetosum.

**ÆRUSCAFORES**, in antiquity, a kind of sharpening stollen, who got their living by

tricks, telling fortunes, and the like, much like modern gypsies. Also, oppressive tax-gatherers.

**ÆS**, (*ws, as, fire, light, ether*, Heb *awig*, from *awu*, *to burn like ether*, i. e. *with a blue, radiant flame*) Copper, Venus. **Æs**, indeed, is a name given by the ancients to brass and copper indiscriminately, for it was not till a late period that these metals were distinguished. The ancients considered brass as only a more valuable kind of copper; and when the difference of their nature came to be discovered, copper was called *æs cyprium* from Cyprus, where the best copper was found, and afterwards only *cyprium*, which in time was converted into *CUPRUM*, which is.

**Æs** *Per æs et libram*, was a formula in the Roman law, by which purchases and sales were ratified. The phrase was originally used in speaking of things sold by weight, or by seals, but it was afterwards used on other occasions. Hence, in adoptions, the formula expressed that the person adopted was bought per *æs et librum*.

**Æs uxorium**, in antiquity, a sum paid by bachelors as a penalty for living single beyond a certain age. A tax first imposed under the censorship of M. Furius Camillus.

**ÆSALON**, in ornithology, a species of falcon, called in English, the Merlin.

**ÆSCHINES**, a disciple of Socrates, was the son of a sausage-maker. He went to the court of Dionysius, the tyrant of Sicily; afterwards he kept a school at Athens for his support. His dialogues are so much in the manner of Socrates, that Menodæmus charges him with having stolen them from that philosopher. Only three of them are now extant, of which, Mr. Le Clerc published a Latin translation, with notes, in 1711, 8vo.

**ÆSCHINES**, an Athenian orator, who flourished about 342 B. C. and distinguished himself by his rivalry with Demosthenes. When the Athenians wished to reward the patriotic labours of Demosthenes with a golden crown, Æschines impeached Ctesiphon, who proposed it, and to their subsequent dispute we are indebted for the two celebrated orations de corona. Æschines was defeated by his rival's superior eloquence, and banished to Rhodes. In his banishment the orator repeated to the Rhodians, what he had delivered against Demosthenes, and after receiving much applause, he was requested to read the answer of his antagonist. It was received with greater marks of approbation, but, exclaimed Æschines, "How much more would your admiration have been raised, had you heard Demosthenes himself speak it!" Æschines died in the 75th year of his age, at Rhodes, or, as some suppose, at Samos. He wrote three orations, and nine epistles, which, from their number, received the name, the first of the *Greces*, and the last of the *Muses*. The orations alone are extant, generally found collected with those of Iſyias.

**ÆSCHYLUS**, the tragic poet, was born at *Æschines*, according to Stanley, in the 63d

Olympiad, but others say later. He was in the sea-fight at Salamis, in which his brother, Amintas, most gallantly distinguished himself. Ælian records, that Æschylus being afterwards accused of blasphemy, was sentenced to be stoned to death, on which, his brother exhibited his arm, which had lost a hand at Salamis, and thereby made such an impression on the judges, that they immediately pardoned Æschylus. This behaviour of his countrymen, added to the resentment which he felt at the preference shewn to the pieces of Sophocles, induced him to retire to Sicily. Of ninety tragedies, the fruit of his ingenious labours, forty of which were rewarded with the public prize, only seven have come safe to us. Prometheus vincitur, Septem duces apud Thebas, Persæ, Agamemnon, Choephori, Eumenides, Supplices. Æschylus is the first who introduced two actors on the stage, and clothed them with the *æes* suitable to their character. He likewise removed murder from the stage. It is said that he wrote in account of the battle of Marathon, in elegant verses. He died, it is commonly ascribed, of a fractured skull occasioned by an eagle letting fall a tortoise from a great height on his head, this happened in the 69th year of his age. Æschylus, s. y. Dr. Blair, exhibits both the beauties and defects of an early original writer. He is bold, nervous, and animated, but very obscure and difficult to be understood, partly by reason of the incorrect state in which his works have been transmitted to us, and partly on account of the nature of his style, which is crowded with metaphors, often harsh and unadorned. He abounds with martial ideas and descriptions. He has much fire and elevation, less of tenderness than force. He delights in the marvellous. The best edition of this author is that of Stanley, printed first at London in 1603, fol and since by Paaw, at the Hague, 2 tom 4to 1745. Mr. Potter published an elegant translation of Æschylus, in English verse, in 1777. Mr. Samuel Butler is preparing (1804) a republication of Stanley's Æschylus, in 8vo with many additional notes by Stanley, from his MSS. preserved in the public library at Cambridge. To these Mr. Butler will add several notes of his own.

**ÆSCHYNOMENE**, Bastard sensitive-plum. A genus of the Linnean class and order diadelphia decandria, with calyx two-lipped, limbed compressed, and truncate one-sided joints. It has nine species, most of which are common to both Indies. Among ourselves, it is chiefly cultivated for the beauty of its flowers, for only two species of it are found to be sensitive in any degree, the *Æ sensitiva* and *Æ Americana*.

**ÆSCULAPIUS**, in the heathen mythology, the god of physic, was the son of Apollo, by Coronis, or as some say, by Larissa daughter of Phlegyas. His father gave him to be educated to Chiron, who taught him the art of medicine. Æsculapius became physician to the Argonauts. He restored many to life, of which Pluto complained to Jupiter, who

struck Æsculapius with thunder Æsculapius received divine honours after death, chiefly at Epidaurus, Pergamus, Athens, Sinyrna, &c Goats, bulls, lambs, and pigs, were sacrificed to him, and the cock and the serpent were sacred to him Æsculapius is represented with a large beard, holding in his hand a staff, round which is wreathed a serpent, his other hand is sometimes supported on the head of a serpent, as the ancient physicians used it in their prescriptions He had two sons, famous for their skill in medicine, Machron and Podalirius, and four daughters, of whom Hygeia, goddess of health is the most celebrated

ÆLÆGIUS, in astronomy, a name of the constellation Ophiuchus

ÆCHELUS The horse-chesnut A genus of the Linnæan class and order heptandria monogamia Its calyx is one-leaved, four or five lobed, inflated, corol four or five petalled, unequally coloured, insert 1 on the calyx, capsule three celled It has three species, all of which have been cultivated in our own country for nearly a century 1 Æ hippocastanum, or common-horse-chesnut, of elegant shape and flower, but unsightly after the fall of the flower, whose nuts may be employed as food for sheep, deer, and poultry 2 Æ pavia, or scarlet horse-chesnut 3 Æ flava, or yellow horse-chesnut, both of which are chiefly propagated for the beauty of their corols

ÆSCULUS HIPPOCASTANUM (from *æscu*, food) The systematic name for the Hippocastanum

ÆLICA, in ancient geography, is supposed to have been the place of the present village of Netherby in Cumberland

ÆSON, son of Cretheus was born at the same birth as Pelius He succeeded his father in the kingdom of Iolus He married Alcimedæ, by whom he had Jason, whose education he entrusted to Chiron, being aided by Pelias When Jason was grown up, he demanded his father's kingdom from his uncle, who persuaded him to go in quest of the golden fleece (vid JASON) At his return, he found his father very infirm, and Medea (vid MEDEA), at his request drew the blood from Æson's veins, and refilled them with the juice of certain herbs which she had gathered and immediately the old man recovered the vigour and bloom of youth

ÆSOP the fabulist, was a Phrygian by birth, and lived in the time of Solon, about the 50th Olympiad He was a slave, and exceedingly deformed If he were not the inventor of fables, he certainly was the improver of that method of writing He was first a slave at Athens, where, probably, he acquired a correct knowledge of the Greek language in its purity He came into the service of a philosopher named Xanthus, from whom he passed to one Idmon, another philosopher, who gave him his liberty He was afterwards taken into the service of Croesus, who employed him on several occasions, and at last sent him to Delphos to offer a sacrifice to Apollo,

and to make a present to the inhabitants, but a quarrel arising between Æsop and the Delphians, he sent back the sacrifice and treasures to the king, upon which, the people in a rage threw him off a rock, and slew him The place being afterwards visited with a plague, the oracle declared it was in consequence of the death of Æsop, upon which, the Delphians, by way of atonement, erected a monument to his memory The best edition of Æsop is that of Hudson, at Oxford, in 1718 Of this work the following is the opinion of Gottl Stolle "This is the best edition of Æsop with which I am acquainted The editor has not only given us a life of Æsop, but has also illustrated it with so many testimonies from the ancients, that, from an ordinary mind, every doubt must vanish respecting the existence of such a person as Æsop" It would, however, be unjust were we not here to state that Housinger's editions of 1741 and 1756, and Ernesti's of 1781, are very admirable

ÆSTIMATIO CAPITIS, a term met with in old law books for a fine paid for offences against persons of quality, according to their several degrees, or heads

ÆSTINA A name given by Fabricius to certain species (constituting a tribe) of the subellula, or dragon fly See SIBELULA

ÆSTIVAL *a* Something connected with, or belonging to summer as æstival signs, i e Cancer, Leo, and Virgo

ÆSTIVATION The disposition of the petals within the floral gem or bud This is 1 Co involute, when the petals are rolled up like a scroll of paper 2 Imbricate, when they lie over each other like tiles on a roof 3 Conduplicate, when they are doubled together at the midrib 4 Valvate or valved (valvata), when as they are about to expand they are placed like the glumes in grasses 5 Unequally-valved, when they differ in size

ÆSTRUS (*αἶστρος*) The gadfly See OISTRUS and OESTRUS

ÆSTUARIUM (from *æstuo*, to be hot) A stove or machine for conveying heat to all parts of the body A vapour-bath

ÆSTUS VOLAFICUS (*æstus*, heat, and *volo*, to fly) A sudden heat and redness of the face, which soon flies off Few volage Eczema

ÆSTUARY, in the ancient baths, a secret passage from the stove into the chambers

ÆSYMNIUM, in antiquity, a monument erected to the memory of the deceased heroes by Æsymnus the Megarian

ÆTHER (*ἠθήρ*, ether, a large space, Syr or *aithep*, from *aithe*, to burn) 1 The firmament 2 The electric gas 3 A gaseous volatile fluid in medicine, obtained by distillation from a mixture of alcohol and a concentrated acid It is much lighter, more volatile, and inflammable than rectified spirit of wine, and possesses stomachic and antispasmodic powers

ÆTHER, also denotes the medium said by ancient philosophers to exist in the regions

above our atmosphere, and supposed of so subtle and penetrating a nature, as to pervade the air, and other bodies, and possess the pores and intervals of all matter. The term æther has ever been embarrassed with vague ideas, yet it has frequently been resorted to by philosophers as a sort of stepping stone whereby difficulties are thought to be surmounted, but unless its existence can be more clearly proved than has yet been done, the use of the word had, perhaps, better be abandoned. The Cartesians used the term *Matériau subtilis*, which is their æther, and in Isaac Newton makes allusions to a similar medium, under the term *subtil spirit*, at the end of his *Principia*, and under the term *æthereal medium* in some queries at the end of his *Optics*. Indeed most philosophers have, at one time or another, brought forth some fragment of their own fancy, in order to avoid the supposition of action among bodies at a distance. Even the great Newton seemed to show some disposition to account for gravitation by the action of a contiguous fluid. This is the subterfuge so much resorted to by precipitate speculists, by the name of the æther of Isaac Newton. He supposes it highly elastic, and much rarer in the pores of bodies and in their vicinity than at a distance, therefore exceedingly rare in the sun, and denser as we recede from him. Being highly elastic, and repelled by all bodies, it must impel them to that side on which it is most rare, therefore it must impel them toward the sun. This is enough of its general constitution to enable us to judge of its fitness for Newton's purpose. It is wholly unfit, for since it is fluid, unequally dense and elastic, its particles are not in contact. Particles that are elastic, and in a state of compression, and in contact, cannot be fluid, they must be like so many blown bladders compressed in a box, therefore they are not in contact, therefore they are elastic by mutual repulsion, that is, by acting on each other at a distance. It is indifferent whether this distance be a million of miles, or the millionth part of an inch's breadth, therefore this fluid does not free Newton from the supposition which he wishes to avoid. Nay, it can be demonstrated, that in order to form a fluid which shall vary in density from the sun to the extremity of the solar system, there must be a mutual repulsion extending to that distance. This is introducing millions of millions of the very difficulties which Newton wished to avoid, for each particle presents the same difficulty with a planet. It is asserted also, that this medium penetrates the substance of bodies even to their very centres. But we would ask, how can a subtle medium, let it be as subtle as we please to imagine, penetrate the solid substance of bodies? It is still matter, and solid, resisting matter otherwise it could impress no force. And that one part of solid substance should penetrate another part of it, is unconceivable, and destroys the very conception of body. It is also asserted, very arbitrarily, that this medium is denser at the surface of great bodies, than at the surface

of those which are less, because the gravitation is stronger towards great bodies than towards those that are less, if the distances be equal. But this, it might easily be shewn, would completely disorder the motions of the planets. In fact, the density of this medium would be inversely as the squares of the distances from remote bodies, and inversely also as the squares of the distances from other near bodies. That is, it would be very dense, and very rare, at the same place, and in the same time and its impulses would be opposite and inconsistent among themselves, having many different, and even contrary, motions at once. Let those who imagine the reality of this medium, reconcile these properties of it to truth and nature. We really think it injurious to the reputation of this prince of philosophers, and a very ill office done to his memory, to bring in his authority for a thing, which he owns to be merely conjectural, or rather, which he asks only by way of quere. However much, therefore, we regard the authority of Newton we still think we are bound, even out of regard to him, to hold his conjecture as a conjecture for we have never heard that since his time any new evidence has been found of the existence of this medium and to admit it without proof, though on the authority of Newton, is a tendency, with the unthinking, to lessen his authority in other points.

This subject has been minutely considered in the appendix to *Baxter on the Soul*, p. 22 to 38, and in Reid's essay on the intellectual Powers of Man, p. 87.

**ÆTHER VITRIOLICUS** *Naphtha vitrioli*. Vitriolic æther of the pharmacopæias is termed sulphuric æther in the new chemical nomenclature. It is mostly employed is an excitant, nervine, antispasmodic, and diuretic in cases of spasms, cardialgia, enteric fever, hysteria, cephalalgia, and spasmodic asthma. Externally it cures tooth-ach and violent pains of the head.

**ÆTHERIAL** *a* Something that belongs to, or partakes of the nature of æther.

**ÆTHERIAL OIL**, a fine, subtle, essential oil, approaching nearly to the nature of a spirit as the æthereal oil of turpentine, which is the pure liquor rising next after the spirit in the distillation of turpentine.

**ÆTHIOPS**, or **ÆTHIOPS MINERAL**, or **HYDRARGYRUS CUM SULPHURE**, a preparation of mercury, made by rubbing in a marble or glass mortar, equal quantities of quicksilver and flowers of sulphur, till the mercury wholly disappears, and there remains a fine deep black powder, whence it has got the name of æthiops, and it is much used in medicine.

**ÆTHIOPS ANTIMONIALIS**, a combination of the sulphurets of antimony and mercury. It is prepared by fusing crude antimony in an earthen crucible, and when it is on the point of fixing, add to it an equal weight of hot mercury. The mixture at first becomes more fluid, and after a while solid when cold it must be levigated in a mortar, and washed.

## A E T

The medical effects of this preparation in small quantities are sudorific, in larger doses a purgative and emetic

**ÆTHIOPS VEGETABILIS** is prepared by burning the sea-wrack or sea-oak in the open air, and then reducing it into a black powder. It is used in scrophulous swellings, and in cleansing the gums and teeth

**ÆTHMOID ARTERY and BONE.** See **ETHMOID ARTERY and BONE**

**ÆTHNA** (αἴθνα, *æthuna*, a furnace, Heb αἴθνα, from αἴθω, to burn) 1 A subterraneous fire 2 A chemical furnace

**ÆTHORES, or ÆTHOLICES** (from αἴθω, to burn) Hot cutaneous pustules

**ÆTHUSA MEUM.** The systematic name for the meum athamanticum, which see

**ÆTHUS'A** Lesser hemlock, or fool's-parsley. A genus of the class and order pentandria digynia. Its fruit is striate, involucrets halved, three-leaved, pendulous. There are three species, of which the *A. cynapium*, with uniform leaves, is common to our own corn-fields

**ÆTIA** (αἰτία, a cause) In medicine, the cause of a disease

**ÆTIANs**, in church history, a branch of Arians, who maintained, that the Son and Holy Ghost are in all things dissimilar to the Father

**ÆTIOLOGION**, a term denoting the state of vegetables which, by growing in the shade, and being deprived of light, become pale, white, and insipid. How this change is produced, the present state of our knowledge will not permit us to explain, but it is a fact of general observation, that the colour of herbs is pale or deep in proportion as they are less or more exposed to the rays of the sun, and those which, for the want of those rays, are pale or white, are said to be ætiolated, from a French word signifying star, as if they grew by star-light. See **COLOURS**

**ÆTIOLOGIA** (αἰτιολογία, from αἰτία, a cause, and λόγος, a discourse) The doctrine of the causes of diseases

**ÆTION**, a celebrated painter, who has left us an excellent picture of Roxana and Alexander, which he exhibited at the Olympic games. It represents a magnificent chamber, where Roxana is sitting on a bed of a most splendid appearance, which is rendered still more brilliant by her beauty. She looks downwards, in a kind of confusion, being struck with the presence of Alexander standing before her. A number of little Cupids flitter about, some holding up the curtain, as if to shew Roxana to the prince, whilst others are busied in undressing the lady, some pull Alexander by the cloak, who appears like a young bashful bridegroom, and present him to his mistress: he lays his crown at her feet, being accompanied by Ephanton, who holds a torch in his hand, and leans upon a youth, who represents Hymen. Several other little Cupids are represented playing with his arms, some carry his lance, stooping under so heavy a weight, others bearing along his buckler, upon which one of them is seated, whom the poet carry in triumph, another lies in ambush

## Æ T N

in his armour, waiting to frighten the rest as they pass by. This picture gained Action so much reputation, that the president of the games gave him his daughter in marriage

**ÆTIOR PHILEBES** (from αἴτη, an eagle, and φιλέω, a verb) Eagle veins: an appellation given by Ruphus Iphesius to the veins which pass through the temple to the head in animals generally, but which in eagles are peculiarly prominent

**ÆTITA**, or **ÆRITES**, a name given to pebbles or stones of any kind, which have a loose nucleus rattling within them, and called in English eagle stones. So far from being a particular genus of fossils themselves, we find ætites among very different genera, but the most valued is that formed of the several varieties of our common pebbles

**ÆTIUS**, one of the most zealous defenders of Arianism, was born in Syria, and flourished about the year 336. After being servant to a grammarian, of whom he learned grammar and logic, he was ordained deacon, and at length bishop, by Eudoxius patriarch of Constantinople. St Epiphanius has preserved 47 of his propositions against the Trinity. His followers were called Ætians

**ÆTINA** (in the itineraries *Æthana*, supposed from αἴθω, to burn, according to Borchart, from *Althuna*, a furnace, or *Ætuna*, darkness, now *Monte Gabello*) A volcano or burning mountain of Sicily, situated in lat 38° N long 15½° E. This mountain, famous from the remotest antiquity both for its bulk and terrible eruptions, stands in the eastern part of the island, in a very extensive plain, called Val Demoni, from the notion of its being inhabited by devils, who torment the spirits of the damned in the bowels of this volcano. Authors are not agreed as to its dimensions, or its height above the surface of the sea. The accounts given of the phenomenon, which have accompanied its eruptions, by sir William Hamilton and Mr Brydone, are exceedingly interesting. According to the observations of the last-mentioned traveller, the height of Ætina is about 12,000 feet. Faujas de S. Fond states it at 10,036 feet. The circumference of the base is commonly reckoned about 180 miles. There are 77 cities, towns, and villages, scattered over different parts of the sides of this mountain, and the number of its human inhabitants above 100,000. The distance from Catania to the summit exceeds 30 miles. The fire which is continually burning in the bowels of this mountain led the poets to place here the forges of the cyclops, under the direction of Vulcan, and the prison of the giants who rebelled against Jupiter. The eruptions of this mountain have likewise been described by several of the ancient poets, as Pindar, Virgil (*Æneid*, b. iii. v. 571), and Lucretius (*lib. vi. v. 639*). Pindar in the fifth decade of an ecle which was composed in the 78th Olympiad, about four or five years after the second eruption mentioned by Thucydides, has a passage thus translated by West

Now under sulph'rous Cym's sea-bound coast,  
And vast Sicily lies her shaggy breast;  
By snowy *Ætna*, nurse of endless frost,  
The pillar'd prop of Heav'n for ever press'd:  
From whose nitrous caverns issuing rise  
Pure liquid fountains of tempestuous fire,  
And veil in ruddy mists the noon-day skies,  
While wrapt in smoke the eddying flames  
aspire,  
Or gleaming through the night with hideous  
Far o'er the redd'ning main huge rocky frag-  
ments pour

The last two eruptions of this volcano we have seen described, took place in July and October, 1787. In the latter of these the stream of lava that issued from the crater was three miles long, about a quarter of a mile broad, and from five to eighteen feet deep.

*ÆTNA SALT*, *Sal Ætna*, a name given by some to the sal ammoniac, which is found on the openings of *Ætna*, and other burning mountains; and sometimes on the surface of the matter thrown out during an eruption. It is sometimes found in cakes, and sometimes in powder, and its colour is either green, yellow, or white. This salt is composed of nitre, sulphur, and vitriol, and is supposed to be formed during the burning of the mountain.

**AFFECTED**, in algebra, is sometimes applied to equations in the same sense as affected. Algebraic quantities which have co-efficients, or any of the characters  $+$ ,  $-$ ,  $\sqrt{\phantom{x}}$ , &c. prefixed, are also said to be affected with the co-efficient, or respective sign.

**AFFECTEDNESS** *s* (from *affected*)  
The state of being affected.

**AFFECTION**, in a general sense, implies an attribute inseparable from its subject. Thus magnitude, figure, weight, &c. are affections of all bodies, and love, fear, hatred, &c. are affections of the mind.

**AFFECTION**, signifying a settled bent of mind toward a particular being or thing, occupies a middle space between disposition, on the one hand, and passion on the other. It is distinguishable from disposition, which being a branch of one's nature, origin ill, must exist before there can be an opportunity to exert it upon any particular object, whereas affection can never be original, because, having a special relation to a particular object it cannot exist till the object have once at least been presented. It is also distinguishable from passion, which, depending on the real or ideal presence of its object, vanishes with its object, whereas affection is a lasting connection, and, like other connections, subsists even when we do not think of the person. Dr Coxan, in his Philosophical Treatise on the Passions, very properly distinguishes between affection and passion, and he accurately discriminates between both these terms, and that feeling which is usually denominated emotion. The term affection, he says, has a different signification from either of the other two, and represents a less violent, and generally a more durable, passion, which, though it has upon the mind a more powerful influence than the manner in which we are affected by them for a continu-

ance; and supposes a more deliberate predilection and aversion, in consequence of the permanent influence of some prevailing quality. This distinguishes it from the transient impulse of passion; nor is it so intimately connected with any external object, which distinguishes it from emotions. The affections sometimes succeed to passions and emotions, because these may have been excited by something that becomes permanently interesting, or they may be gradually inspired, by a deliberate attention to the good or bad qualities of their objects. In this philosophic sense of the word, affection is applicable to an unpleasant as well as pleasant state of the mind, when impressed by any object or quality. It may be produced by any thing that torments or corrodes the heart, as well as by that which charms and delights it. Custom, however, chiefly appropriates the term to the kind and benevolent affections. Coxan on the Passions, p. 10.

**AFFECTION** (*affectus*, or *affectio*, from *afficio*, to disturb.) In medicine, a peculiar disposition of the mind or body to disease or health.

**AFFECTIONATE** *a* (*affectio* *ante*, from *affection*) 1 Full of affection, warm, zealous (*Spirat*) 2 Fond, tender (*Sidney*) 3 Benevolent tender (*Rogers*)

**AFFECTIONATELY** *ad* (from *affectio*) Fondly, tenderly, benevolently.

**AFFECTIONATENESS** *s* (from *affectio*) Fondness, tenderness, good-will.

**AFFECTED** *a* (from *affectio*) 1 Affecting, conceited, obsolete (*Shakspeare*) 2 Inclined, mentally disposed (*Rom*)

**AFFECTUOUSLY** *ad* (from *affect*) In an affecting manner.

**AFFECTIVE** *a* (from *affect*) That does affect, that strongly touches (*Rogers*)

**AFFECTUOSITY** *s* (from *affectu*) Passionateness.

**AFFECTUOUS** *a*. (from *affect*) Full of passion little used.

**AFFERORS, AFFERATORES**, in law, persons appointed in courts-lects, and other places, upon oath, to settle and moderate the fines of such as have committed faults arbitrarily punishable, or which have no express penalty set down by statute. See Stat 25 Edw III cap 7.

**AFFETTUOSO, or CON AFFETTO**, in the Italian music, intimates that the part to which it is added ought to be played in a tender affecting way, and consequently rather slow than fast.

**AFFIANCE** *s* (*affiance*, from *affier*, Fr) 1 A marriage contract (*Spenser*) 2 Trust in general, confidence (*Shaks*). 3 Trust in the divine promises and protection (*Atterb*)

**To AFFIANCE** *v. a* (from the noun) 1 To betroth; to bind any one by promise to marriage (*Spenser*). To give confidence (*Pope*)

**AFFIANCER** *s* (from *affiancer*) He that makes a contract of marriage between two parties.

**AFFIDATION, AFFIDATURE** *s* (from *affido*, Lat. See *AFFID*) Mutual contract, mutual oath of fidelity.



**AFFIDAVIT** *s* (*affidavit* signifies, in the language of the common law, *he made oath*) A declaration upon oath (*Spectator*)

**AFFIED** *particip. u.* (from the verb *affy*, derived from *afide*) Joined by contract, affianced (*Shakspeare*)

**AFFILIATION** *s* (from *ad* and *filius*, Lat.) Adoption, the act of taking a son (*Chambers*)

**AFFINAGE** *s* (*affinage*, Fr.) The act of refining metals by the cuppel

**AFFINDRA** (*अफिन्द्र*, from *अफिन्द्र*, to perspire) Cerus. In ancient medicine so named from a power ascribed to it of promoting perspiration, a quality for which it is never employed in modern times

**AFFINED** *a* (from *affinis*, Lat.) Related to another (*Shakspeare*)

**AFFINITY** *s* (*affinitas*, Fr. from *affinis*, Lat.) 1 Relation by marriage 2 Relation to, connection with The Romaniists talk of a spiritual affinity, contracted by the sacrament of baptism and confirmation — In that church, a god-father may not marry with his god-daughter without a dispensation Affinity is not found in real kinship, it is no more than a kind of fiction, introduced on account of the close relation between husband and wife — It is void as to co. sc. where the cause of it ceases — Hence a woman who is not capable of being a witness for her husband's brother, during his life-time is allowed to be a witness, when a widow, by reason the affinity is dissolved Yet with regard to the civil law, marriage, affinity is not dissolved by, though it is in every thing else

**AFFINITY** in the civil law, is divided into civil, that between free persons, and servile, that between slaves

**AFFINITY**, legitimate, is that contracted by a proper and legal matrimony, or, between slaves, by contubernium

**AFFINITY**, illegitimate, that contracted out of legal marriage Affinity may be contracted by an unlawful commerce thus a person who has impregnated two sisters, is prohibited marrying either of them, thus an affinity may commence between husband and wife, by his lying with her sister

**AFFINITY** is also used to denote conformity or agreement Thus we say, the affinity of languages, the affinity of words, the affinity of sounds, &c

**AFFINITY**, in natural philosophy, 1 The tendency which the particles of matter have to be attracted or united to each other 2 Elective attraction (in chemistry) simple, reciprocal, or double 3 Sympathy or consent of parts (in physiology) The power by which one organ is affected by another, whether directly or inversely See **SYMPATHY**

**AFFINITY**, chemical, is that power by which the particles of different bodies are combined, so as out of two or more substances to form one uniform whole, which is not decomposable by mechanical means, and the properties of which are often different from those of the substances of which it is formed Thus

affinity exists in very different degrees among different bodies, and its varieties are among the most wonderful objects of chemical research The term is synonymous with the elective attraction of Bergman, and is called by some other chemists the attraction, or affinity of composition Like many other terms, in common as well as scientific language, it is of metaphorical origin, and in this sense may be called the series of relationships between simple substances From the appearance of certain external characters of resemblance between different animals, zoologists have contended for the existence between them of certain natural connexions, or family relationships, and have hence systematically arranged the animal kingdom into distinct tribes or families From a similar appearance among plants, a similar system has been adopted by botanists From the appearance of certain internal powers of reciprocal attraction between bodies of a simpler and more elementary form, chemists have, in like manner, contended for a similar series of connexions or relationships between these last, and to those connexions or relationships they have given the name of affinities

Chemical affinity may, therefore, be regarded as the principle of chemical action — chemical attraction as the same principle in a state of operation, by which alone the degree of affinity is graduated or measured for the affinity still exists whether the attraction be taking place or not Hence where the attraction is strong, we assert the affinity to be close, where it is weak we assert it to be remote Yet in common language the terms are often used convertibly, and chemical or elective attraction, and chemical or elective affinity are often employed, though not always with strict propriety, to explain each other While the attraction of the philosopher takes place between masses situated at a greater or less distance from each other, the affinity of which we have been treating operates only upon heterogeneous particles at imperceptible distances, or in the vicinity of contact A general idea of this affinity may be obtained from the following experiment Common salt, when thrown into pure water, melts, and very soon diffuses itself through the whole of the liquid, it may be known by the taste The salt is now combined with the water, and cannot be separated by filtration or any mechanical means But if a quantity of spirit of wine be poured into the solution, the whole of the salt immediately falls to the bottom The particles of the salt unite with those of the water in consequence of the attraction or affinity which subsists between them spirit of wine has also an affinity for water, much stronger than salt has, and it is in consequence of this superior affinity that the water leaves the salt to unite with the spirit of wine, and the salt, being unsupported, necessarily falls by its gravity All substances which are capable of combining together, are said to have an affinity for each other those, on the contrary, which do not unite, are said to have no affinity for each



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other. The first of these may be instanced in the above experiment; and the last, in water and oil, which, having no mutual affinity, cannot be made to combine. It appears also, that substances differ in the degree of their affinity for other substances; since, in our experiment, the spirit of wine displaced the salt and united with the water, and consequently has a stronger affinity for water than salt has.

As this affinity is the great agent in all the operations of nature and art, that are referable to the science of chemistry, a consideration of its nature is an object of the utmost importance. While its laws are unknown, chemistry is not a science, but a wilderness of facts, without beauty, without order, and almost without utility. It is the knowledge of affinity which guides us in our investigation of the phenomena of nature, which shews us their order, and points out their mutual dependence, and which enables us to direct them as we think proper, to make them subservient to the improvement of the arts, and thus to render them the ministers of our comforts and enjoyments. The general principles, or laws, which are observed in the operations of this power, are the following: 1 It takes place between the constituent or integrant particles of bodies of different natures, for when two bodies are united by affinity, how small a portion soever of the compound we examine, we shall always find it to contain both of the ingredients, and the bodies must be of different natures, otherwise the only power that would be exerted is that of cohesion; or, as it is called, the affinity of aggregation. 2 Its efficacy is in the inverse ratio of the affinity of aggregation, for, as it is the latter power which combines the integrant and homogeneous particles, and holds them together, it so far hinders them from separating in order to join the parts of another body, and therefore the greater this force is, the less efficacious is the affinity of composition, and vice versa. 3 When two or more bodies are united by this affinity, they suffer a change of temperature at the instant of their union. This change depends upon that produced in the degree of attraction for the matter of heat which is sometimes disengaged in the process, and sometimes absorbed. 4 The compound possesses properties different from those which each of the bodies possessed before their union. This difference takes place, not only in the taste, but also in the smell, colour, form, consistency, and fusibility of the compound. Instances are constantly occurring in chemical operations in proof of this law. 5 Bodies have not all the same degree of chemical attraction with regard to one another, but each body has its peculiar degree of affinity for other bodies. This law, which must have been observed as early as chemical phenomena were noticed, is abundantly confirmed by constant experience. 6 That bodies unite chemically, it is, in all respects, that one of them, at least, is fluid, or that of gaseous or elastic fluidity, which is very unfavourable to

combination, but the liquid or semi-elastic state, whether by fusion or solution. The union in this case depends not on any superior power possessed by that body which is termed the solvent, but results from the reciprocal action of the molecules of the two bodies on each other. Although every chemical combination is produced by the operation of the same general principle, modified and directed by circumstances, yet as the phenomena vary considerably in different cases, it has been found expedient, for the sake of perspicuity, to divide them into classes, and to distinguish the various modes in which affinity operates by different names. Thus we have concurrent affinity, simple and compound affinity, disposing, quiescent, divellent, resulting affinity, &c. all which will be explained as we proceed, when the various phenomena, necessary to illustrate the subject, will present themselves. All the known instances of affinity may be arranged under the three first classes, though some chemists, and perhaps with propriety, have taken in also the fourth for this purpose. I. Concurrent affinity is that by which two or more substances are united into one homogeneous body. When two bodies are employed it is evident that, if the force of their mutual affinity is ever so little greater than the sum of their respective degrees of cohesion, combination will take place: thus, if a piece of quick lime be put into muriatic acid, the two substances will unite and form an homogeneous compound, called muriat of lime, possessing properties which differ both from those of the lime, and those of the acid. That this rule may be extended to more than two substances, will appear on mixing together sulphuric acid, alumine, and potash, the concurrent affinities being greater than the force of cohesion, the substances will unite and form common alum, a salt possessing peculiar properties, which could not be inferred from those of its elements. II. Simple affinity, or single elective attraction, is that by which a body, compounded of two substances, is decomposed on the approach of a third substance, having a greater affinity for one or both the other substances than they have for each other, and by which a new combination is produced, and a new substance is formed. Thus when a metal is dissolved by an acid, and kept in union with it by a certain degree of elective attraction, if an alkali be presented to this compound, a decomposition takes place, the alkali unites with the acid by virtue of a superior degree of affinity, and forms a new compound, while the metal is precipitated. Of the same kind is the experiment related in the beginning of this article. So also, when the sulphuric acid is combined with magnesia, forming with it the salt called sulphat of magnesia, as soon as potash is presented, the acid leaves the magnesia, which is precipitated, and unites with the potash. The following is an instance in which two combinations take place by simple affinity. When some potash is dropped into tartarous acid, part of the acid unites with the al-

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ball, and forms tartarite of potash, after this the remainder of the acid combines with the tartarite just formed, and composes a new salt known by the name of acidulous tartarite of potash, or tartar. Strictly speaking, this is rather a case in which the concurrent is succeeded by the elective affinity.—In the beginning of the last century, viz about the year 1718, Geoffroy invented a method of representing the different degrees of affinities, which he called tables of affinity. His method consisted in placing each of the substances whose affinities he wished to express at the top of a column, and the substances with which it united in the same column below it, in the order of their respective affinities. According to this method, the affinity of water for spirit of wine and for common salt would be marked thus

WATER

Spirit of wine  
Common salt

This method has been universally adopted by succeeding chemists, and has contributed very much to the advancement of the science. Geoffroy's table consisted of 17 columns, and in 1750 Gellert published a new table extended to 28 columns, at the bottom of each of which was a list of substances which he had

found not to be acted upon by the body at the head of the column. Rudiger in 1766 gave a table of affinity reduced to 15 columns. M. Limbourg, in 1788, extended the number of columns to 33, and otherwise much improved the tables. From this period, the importance of the subject being fully established, tables were multiplied, and the general system of affinity was investigated by the most able chemists. At length, in 1775, the illustrious Bergman published his dissertation on elective attractions, and successive editions of his tables made their appearance in 1779 and 1783. In these tables, which do honour to the skill and industry of their author, the affinities of no less than 60 substances are clearly ascertained, and the distinction made between those that take place in the moist and in the dry way. His method of registering cases of compound affinity, will be noticed when we come to that part of our subject. The following tables are improved and enlarged from Bergman's by Dr Pearson, and corrected by the latest discoveries. Their utility is almost unspeakable, for they enable us to discover any particular fact we are enquiring after, as far as simple affinity is concerned, and to compare and foretel, by inspection, the results of a great variety of processes and experiments.

TABLE I. SIMPLE ELECTIVE AFFINITIES.

In Water, or by Solution.

1 Caloric	Platina Mercury Gold	Fixed alkalis	5 Silica	
Oxygen	Nitrous gas	Barytes Strontian Lime Magnesia Phosphorus Fixed oil Ammonia Ether	Fluoric acid	Succinic a
Ether	Muriatic acid	Hydrogen gas?	Potash Soda Barytes? Strontian?	Fluoric a
Alcohol	Nitrous acid		6 Alumina	Phosphoric a
Ammonia	Sulphuric acid	4 Saline Sulphurets	Sulphuric acid	Saccharific a
Water	White Oxyd of Manganese	Oxygen	Nitric a	Molybdic a
Volatile oils	Hydrogen?	Oxyd of gold — silver — mercury — arsenic — antimony — bismuth — copper — tin — lead — nickel — cobalt — manganese — iron	Muriatic a	Nitric a
Glass		Other metallic oxids	Fluoric a Arsenic a Oxalic a Suberic a Farturous a Phosphoric a	Muriatic a Suberic a Succinic a Citric a Farturous a Arsenic a
Mercury			Acetous and other acids	Formic a
Bases of all gases	2 Oxygen		Alkalies Barytes? Strontian?	Lactic a Benzoic a Acetous a
	Volatile oils		7 Barites	Boracic a
	Alcohol	Carbon	Sulphuric a	Sulphureous a
	Water	Water	Oxalic a	Nitrous a
Bases of Muriatic and other undecomposed acids	3 Sulphur	Alcohol		Carbonic a
	Oxygen	Ether?		Prussic a
Carbon	Molybdic Oxyd and acid			
Phosphorous	Oxyd of lead			
Sulphur	— tin			
Light?	— silver			
	— mercury			
Zinc	— arsenic			
Copper	— antimony			
Lead	— iron			
Iron				
Silver				

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Fat oil Sulphur	Water	Carbonic a	Oxyd of bismuth	as: Boracic Acid
8 Strontia.	Fat oil	Prussic a	antimony	Lime
Sulphuric acid	Sulphur	Water	arsenic	Barytes
Oxalic a	Phosphorus	Fat oil	mercury	Strontia
Tartarous a	10 Magnesia	Sulphur	silver	Magnesia
Fluoric a	Oxalic acid	Metallic oxyds	gold	Potash
Nitric a	Phosphoric a	See No 15	platina	Soda
Muriatic a	Sulphuric a	14 Water	Water	Ammonia
Succinic a	Fluoric a	Potash	Alcohol	Alumine
Phosphoric a	Sebacic a	Soda	17, 18, 19, 20, 21	Metallic oxyds
Acetous a	Arsenic a	Ammonia	Nitrous, Nitric,	Water
Arsenic a	Saccholactic a	Alcohol	Muriatic, Oxy	Alcohol
Boracic a	Succinic a	Carbonat of Am-	muriatic, Nitro-	24, 25 Oxalic and
Carbonic a	Nitrous a	monia	muriatic Acids	Tartarous Acids
Other acids?	Muriatic a	Ether	Potash	Lime
Fixed alkalies	Suberic a	Sulphuric acid	Soda	Barytes
Water	Tartaric a	Sulphat of Potash	Barytes	Strontia
Fat oil	Citric a?	alumina	Strontia	Magnesia
Sulphur	Formic a	iron	Lime	Potash
Hydrosulphuret	Lactic a	Oxymuriat of mer-	Magnesia	Soda
9 Lime	Benzoic a	cury	Ammonia	Ammonia
Oxalic acid	Acetous a	Other compounds,	Alumine	Potash
Sulphuric a	Boracic a	not decomposed	Metallic oxyds	Soda
Tartaric a	Sulphurous a	by Sulphuric a	See No 15	Alumine
Succinic a	Carbonic a	Silex	Water	Metallic oxyds
Phosphoric a	Prussic a	15, 16 Sulphuric	Alcohol	Water
Saccholactic a	Sulphur	and Sulphurous	22 Fluoric Acid	Alcohol
Nitric a	11, 12, 13 Potash,	acids	Barytes	20 Citric Acid
Sebacic a	Soda, Ammonia	Barytes	Strontia	Lime
Muriatic a	Sulphuric acid	Strontia	Lime	Barytes
Suberic a	Nitric a	Potash	Barytes	Strontia
Fluoric a	Sebacic a	Soda	Strontia	Magnesia
Phosphoric a	Muriatic a	Lime	Magnesia	Potash
Oxalic a	Phosphoric a	Magnesia	Potash	Soda
Tartaric a	Oxalic a	Ammonia	Soda	Ammonia
Arsenic a	Tartaric a	Alumine	Ammonia	Alumine
Formic a	Arsenic a	Jirgma?	Alumine	Metallic oxyds
Lactic a	Succinic a	Oxyd of zinc	Silex	Water
Citric a	Citric a	iron	Water	Alcohol
Benzoic a	Formic a	manganese	Alcohol	
Acetous a	Lactic a	cobalt		
Boracic a	Benzoic a	nickel		
Sulphurous a	Acetic a	lead		
Nitrous a	Saccholactic a	tin		
Carbonic a	Boracic a	copper		
Prussic a	Sulphurous a			
Barytes?	Nitrous a			

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37, Benzole Acid.		38 Chromic Acid.	Formica.	48 Oxyd of Nickel
White oxyd of arsenic	Lime	Potash	Arsenic a	Oxalic acid
Potash	Magnesia	Soda	Lactic a.	Muriatic a
Soda	Alumine	Oxyd of lead	Prussic a	Sulphuric a.
Ammonia		— copper	Potash	Tartareous a.
Barytes	Metallic oxyds		Ammonia	Nitric a.
Lime		39 Molybdic Acid	Fat oil	Sebacic a
Magnesia			Water	Phosphoric a
Potash	Water	Sulphur	44 Oxyd of Titanium	Fluoric a.
Soda	Alcohol	Potash		Saccholactic a
Ammonia	33, 34, 35 Sebacic, Phosphoric, and Arsenic Acids.	Soda	Sulphuric a	Succinic a
Alumine		Absorbent earths	Nitrous a	Citric a
Metallic oxyds		Metallic oxyds	Muriatic a	Formic a.
Water		40 Tungstic Acid.	Prussic a	Acetous a
Alcohol			Oxymuriatic a	Arsenic a
28 Succinic Acid.	Lime	Lime	Nitromuriatic a	Lactic a
Barytes	Barytes	Barytes		Boracic a
Lime	Strontia	Magnesia	45 Oxyd of Uranium	Prussic a
Magnesia	Magnesia	Potash		Carbonic a
Potash	Potash	Soda	Sulphuric acid	Ammonia
Soda	Soda	Ammonia	Nitromuriatic a	40 Oxyd of Calt
Ammonia	Ammonia	Alumine	Muriatic a	Oxalic acid
Alumine	Alumine	41 Pyromucous Acid	Nitric a	Muriatic a
Metallic oxyds	Metallic oxyds		Phosphoric a	Sulphuric a
Water	Water	Potash	Acetous a.	Tartareous a
Alcohol	Alcohol	Soda	Galic a	Nitric a
29 Saccholactic Acid	40 Prussic Acid	Barytes	Prussic a	
Lime	Metallic oxyds	Lime	Carbonic a	
Barytes	Potash	Magnesia	Sulphur	
Magnesia	Soda	Ammonia	Water	
Potash	Ammonia	Alumine	46 Oxyd of Tellurium	Sebacic a
Soda	Alumine	Tartaria		Phosphoric a
Ammonia	41 Carbonic Acid	Metallic oxyds	Nitrous acid	Fluoric a
Alumine	Barytes		Nitromuriatic a	Saccholactic a
Metallic oxyds	Strontia	Lime	Sulphuric a	Succinic a
Water	Lime	Potash		Citric a
Alcohol	Magnesia	Soda	Sulphur	Formic a
30, 31, 32. Acetic, Lactic, and Formic Acids	Alumine	Ammonia	Alkalies	Lactic a
Barytes	37 Carbonic Acid		Mercury	Acetous a
Potash	Barytes	Metallic oxyds	Water	Arsenic a
Soda	Strontia	Alumine	47 Oxyd of Manganese	Boracic a
Ammonia	Lime	40 Oxyd of Arsenic		Prussic a
Alumine	Potash		Oxalic acid	Carbonic a.
Metallic oxyds	Soda	Muriatic acid	Tartaric a	Ammonia
Water	Magnesia	Oxalic a	Citric a	50 Oxyd of Bismuth
Alcohol	Ammonia	Sulphuric a	Fluoric a	Oxalic acid
30, 31, 32. Acetic, Lactic, and Formic Acids	Alumine	Nitric a	Phosphoric a	Arsenic a
Barytes	Metallic oxyds, as in No 15	Sebacic a	Nitrous a	Tartaric a
Potash		Tartaric a	Sulphuric a	Phosphoric a.
Soda		Phosphoric a	Muriatic a	Sulphuric a
Strontia		Fluoric a	Sebacic a	Sebacic a
Ammonia		Saccholactic a	Arsenic a	Muriatic a.
		Succinic a.	Acetous a	Nitric a
		Citric a	Prussic a	Fluoric a
			Carbonic a	Saccholactic a

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Succinic a	Tartareous a	Sulphurous a	Muriatic a	Sebacic a.
Citric a.		Suberic a	Prussic a	Prussic a
Formic a	Gallie a	Zoönic a	Carbonic a	
Acetous a	Camphoric a	Nitric a	Ammonia	Fixed alkalis
Prussic a	Sulphuric a	Pyromucous a		
Carbonic a	Saccholarctic a	Fluoric a	58 Oxyd of Sul- ver	Ammonia
Ammonia	Muriatic a	Citric a.		61 Alcohol
	Pyromucous a	Formic a	Muriatic acid	Water
61 Oxyd of Anti- mony	Nitric a	Acetous a	Sebacic a	Ether
	Sebacic a	Lactic a	Oxalic a	Volatile oils
Sebacic acid	Phosphoric a	Boracic a	Sulphuric a	Ammonia
	Arsenic a	Prussic a	Saccholarctic a	Fixed alkali
Muriatic a.	Fluoric a	Carbonic a	Phosphoric a	Alkaline sulphuret
	Succinic a	Fixed alkali		
Oxalic a	Citric a	Fat oil		
	Formic a			
Sulphuric a	Lactic a	56 Oxyd of Cop- per		
Pyromucous a		Pyromucous acid		
Nitric a	Acetous a	Oxalic a		
Tartareous a	Boracic a			
Saccholarctic a	Prussic a	Tartareous a		
Phosphoric a		Muriatic a		
Citric a	Carbonic a	Sulphuric a		
Succinic a	54 Oxyd of Lin			
Fluoric a	Pyromucous acid	Saccholarctic a		
Arsenic a	Sebacic a	Nitric a		
Formic a.		Sebacic a		
Lactic a	Tartareous a	Arsenic a		
Acetous a	Muriatic a	Phosphoric a		
Boracic a	Sulphuric a	Succinic a		
Prussic a	Oxalic a	Fluoric a		
Carbonic a	Arsenic a	Citric a		
	Phosphoric a	Formic a		
Sulphur	Nitric a	Acetous a		
55 Oxyd of Zinc	Succinic a	Lactic a		
	Fluoric a	Boracic a		
Oxalic acid	Saccholarctic a	Prussic a		
	Citric a			
Sulphuric a	Formic a	Carbonic a		
Pyromucous a	Lactic a			
Muriatic a	Acetous a	Potash		
Saccholarctic a	Boracic a	Soda		
Nitric a	Prussic a	Ammonia		
Sebacic a		Compound salts		
Tartareous a		Fat oil		
Phosphoric a	Potash			
Citric a	Soda	57 Oxyd of Mer- cury		
Succinic a	Ammonia			
Fluoric a		Sebacic acid		
Arsenic a	55 Oxyd of Lead	Muriatic a		
Formic a.				
Lactic a.	Sulphuric acid	Oxalic a		
	Sebacic a	Succinic a		
Acetous a.		Phosphoric a		
Boracic a	Saccholarctic a	Arsenic a		
Prussic a	Oxalic a	Sulphuric a		
	Arsenic a	Saccholarctic a		
Carbonic a	Tartareous a	Tartareous a		
Ammonia	Phosphoric a.	Citric a		
		Nitric a		
57 Oxyd of Iron	Muriatic a	Fluoric a		
	Molybdic a	Acetous a		
Sebacic acid	Benzoyl a			

# A F F I N I T Y.

## TABLE II. SIMPLE ELECTIVE AFFINITIES

*In Fire, or by Fusion*

1. Oxygen	Antimony	Sebacic a	Ammonia	Silver
Carbon	Cobalt	Formic a.		Tin
Zinc	Nickel	Lactic a	Alumine	Alkaline sulphuret
Iron	Bismuth	Benzoic a	21, 22, 23, 24, 25,	32 Nickel
Hydrogen	Mercury	Acetous a	26, 27 Fluoric,	Iron
Manganese	Arsenic	Fixed alkali	Boracic, Barytic,	Cobalt
Cobalt	Carbon	Sulphur	Silicic, Saccharic,	Arsenic
Nickel	4 Siler	Oxyd of lead	Silacic, Phosphoric, and Arsenic Acids	Copper
Lead	Potash	9 10, 11 Potash,		Gold
Tin	Soda	Soda, Ammonia		Tin
Phosphorus	Phosphoric acid	Phosphoric acid	Lime	Antimony
Copper	Oxyd of lead	Boracic a	Barytes	Platina
Bismuth	5 Alumine	Arsenic a	Strontia	Bismuth
Antimony	Phosphoric acid	Sulphuric a	Magnesia	Lead
Mercury at 600°	Boracic a	Succinic a	Potash	Silver
Arsenic	Arsenic a	Fluoric a	Soda	Zinc
Sugar	Sulphuric	Nitric a	Metallic oxyds	Alkaline sulphuret
Sulphur	Nitric	Muriatic a	Ammonia	Sulphur
Caloric	Muriatic	Sebacic a.	Alumine	33 Cobalt
Gold	Sugar	Formic a	28 Succinic Acid	Iron
Silver	Sebacic	Lactic a		Nickel
Platinum	Succinic	Benzoic a	Barytes	Arsenic
Mercury at above	Formic	Acetous a	Strontia	Copper
1000°	Lactic		Lime	Gold
White oxyd of	Benzoic	Barytes	Magnesia	Platina
Manganese	Acetous	Lime	Potash	Tin
2 Sulphur	Potash	Magnesia	Soda	Antimony
	Sulphur	Alumine	Metallic oxyds	Zinc
	Oxyd of lead	Silic	Ammonia	Alkaline sulphuret
	6 Barytes	Sulphur		Sulphur
Oxygen	Phosphoric acid	12 Sulphuric Acid	Alumine	34 Bismuth
Potash	Boracic a	Potash	29 Arsenic	Lead
Soda	Arsenic a	Soda		Silver
Iron	Sulphuric a	Barytes	Nickel	Gold
Copper	Succinic a	Strontia	Cobalt	Mercury
Tin	Fluoric a	Lime	Copper	Antimony
Lead	Nitric a	Magnesia	Iron	Tin
Silver	Muriatic a	Jargonia	Silver	Copper
Cobalt	Sebacic a	Metallic oxyds	Tin	Platina
Nickel	Formic a	Ammonia	Lead	Nickel
Bismuth	Lactic a	Alumine	Gold	Iron
Antimony	Benzoic a	14, 14, 15, 16, 17,	Platina	Zinc
Mercury	Acetous a	18, 19, 20 Nitrous, Nitric,	Zinc	Alkaline sulphuret
Arsenic	Fixed alkali	Muriatic, Oxy	Antimony	Sulphur
Uranium	Sulphur	muriatic, Alca-	Alkaline sulphuret	35 Antimony.
Molybdena	7, 8 Lime, Mag-	lous, Lactic, and	Sulphur	Iron
Tellurium	nesia	Formic Acids	30 Tellurium	Copper
3 Saline Sulphu-	Phosphoric acid	Barytes	Mercury	Tin
rets,	Boracic a	Potash	Sulphur	Lead
Manganese	Arsenic a.	Soda	31 Manganese	Nickel
Iron	Sulphuric a	Strontia		Silver
Copper	Succinic a	Lime	Copper	Bismuth
Tin	Fluoric a	Magnesia	Iron	Zinc
Lead	Nitric a	Metallic oxyds	Gold	Gold
Silver	Muriatic a			Platina
Gold	Suberic a.			Mercury
				Arsenic

# A F F I N I T Y.

Cobalt Alkaline sulphuret Sulphur	Alkaline sulphuret Sulphur	Iron Alkaline sulphuret Sulphur	Tin Alkaline sulphuret Sulphur	Antimony Alkaline sulphuret Sulphur
36. Zinc.	38 Tin	40. Copper.	Zinc	Gold
Copper	Zinc	Gold	Bismuth	Copper
Antimony	Mercury	Silver	Copper	Tin
Tin	Antimony	Arsenic	Antimony	Bismuth
Mercury	Copper	Iron	Arsenic	Zinc
Silver	Gold	Manganese	Iron	Antimony
Gold	Silver	Zinc	Alkaline sulphuret	Nickel
Cobalt	Lead	Antimony	Sulphur	Cobalt
Arsenic	Iron	Platina	42 Silver	Manganese
Platina	Manganese	Tin	Lead	Iron
Bismuth	Nickel	Lead	Copper	Lead
Lead	Arsenic	Nickel	Mercury	Silver
Nickel	Platina	Bismuth	43 Platina	Mercury
Iron	Bismuth	Cobalt		Copper
37 Iron	Cobalt	Mercury		Silver
Nickel	Alkaline sulphuret	Alkaline sulphuret		Lead
	Sulphur	Sulphur		Bismuth
	39 Lead	41 Mercury		Tin
Cobalt	Gold	Gold		Antimony
Arsenic	Silver	Silver		Iron
Manganese	Copper	Platina		Platina
Copper	Mercury	Lead		Zinc
Gold	Bismuth			Nickel
Silver	Tin			Arsenic
Tin	Antimony			Cobalt
Antimony	Platina			Manganese
Platina	Arsenic			
Bismuth	Zinc			
Lead	Nickel			
Mercury				

In the first of these tables are marked, in order, the elective affinities, as far as they are known, of 63 of the most important chemical substances. The order in which these are arranged will appear on inspection, and may be illustrated by an example, the following ones will also shew the use and application of the table.

If it be required to decompose an aqueous solution of muriat of soda, or common salt, being a compound formed of muriatic acid and soda, the first enquiry is, which is to be set at liberty, the acid or the soda? Suppose the acid, I am then to find a substance whose affinity with soda is greater than that of muriatic acid. Turning to No. 11, I find two substances, sulphuric and nitric acid, standing above the muriatic, the addition of either of these to the given solution will decompose the salt, and the acid may be obtained in a disengaged state. If the soda is wanted, I find from No. 17, the column containing the affinities of muriatic acid, that the affinity of potash for that acid is greater than that of soda, consequently by employing this substance, I obtain the soda free, and the potash uniting with the muriatic acid, forms muriat of potash. Again, if a part of lime (a compound of lime and citric acid) is to be decomposed, I find from No. 10, that it cannot be done so as to set at liberty the lime, because this stands first in the column, and has therefore a greater affinity for

the acid than any other substance, but from the column of lime, No. 8, it appears that no less than 13 acids will each of them separate the lime, so as to leave the citric acid disengaged. The lime, however, may be separated by another process, suppose, for instance, that muriatic acid has been employed to precipitate the citric acid, and the muriat of lime thus formed be removed into another vessel, then by referring to No. 17, I learn that there are four substances that have a greater affinity for muriatic acid than lime has, and therefore the use of any one of them would join with the acid, and set the lime at liberty. If the decomposition of sulphat of barytes be required, it is plain from No. 6 and No. 14, that neither the barytes nor the acid can be separated in this manner. All the affinities registered in this table take place through the medium of water, in which one, at least, of the substances is dissolved, and therefore the temperature cannot exceed that of boiling water but those in

The second table, are produced without the medium of water, by the agency of fire, and at a temperature equal to the fusion of at least one of the substances employed. This table contains the affinities of 45 substances, arranged in a similar manner with the former, and as its application is exactly the same, any further illustration is unnecessary.

Other contrivances have been made to express

# AFFINITY.

more perfectly the different cases of simple affinity, and the circumstances attending them; the most ingenious and useful of these are the schemes of Bergman, by which we are enabled to state clearly and concisely the result of the experiment, the temperature of the substances, the menstruum in which they are dissolved, and the manner or state of the new substance. We shall here give one example of this mode of registering, and refer for others to the article **ELECTIVE ATTRACTION**.

## Muriat of Potash

Muriat of Soda	{	Muriatic acid	Potash
		Water 213°	

This scheme expresses, that if to a boiling hot solution of muriat of soda in water, potash be added, a decomposition takes place, muriat of potash being formed, and the soda being set at liberty. The straight line under soda, and the pointless bracket under muriat of potash, express that both substances remain in solution.

III Compound Affinity, or double elective attraction, is that which takes place when two bodies, each consisting of two principles, suffer decomposition by a reciprocal exchange and union of their elements, by which two new compound bodies are produced. In a more general sense, the term may be said to comprehend all those cases of affinity where more than three bodies are present at one time and produce combinations which would not have been formed without their united action. In all cases of compound affinity, there are two kinds of affinity to be considered, which it may be proper here to define —

Quiescent affinity is that which tends to preserve the compounds in their first state,

Divellent affinity is that which tends to destroy the former, to separate the principles of the old compounds, and by changing their order, to form new compounds. Whenever, therefore, the sum of the divellent affinities is greater than that of the quiescent ones, a decomposition and a new combination will evidently take place.

An example will render this more familiar. Sulphat of potash, or a combination of the sulphuric acid with potash, cannot be decomposed by either quicklime or the cold nitric acid individually, but pour into a solution of the former neutral salt a proper quantity of the nitrat of lime, formed by the union of the nitric acid with quicklime, the two combinations will be mutually decomposed, the nitric acid uniting with the potash to form common nitre, while the sulphuric acid uniting with the lime forms sulphate of lime, which being less liable to solution than the nitre, is therefore precipitated. This affinity may probably appear strange and unaccountable; but it may be explained in the following manner. The sulphuric acid cannot be separated from potash, either by lime or by the nitric acid, because it has a stronger affinity with that alkaline substance than either of the two latter bodies has with it

or with the alkali. But when to the sulphat of potash a compound of the nitric acid with lime is presented, the nitric acid immediately exerts its tendency to combine with the potash, while the sulphuric acid is at the same time attracted by the lime; so that the decomposition of the sulphat of potash is begun by the action of the nitric acid, and completed by that of the lime. To explain this double affinity still more clearly, suppose the force of adhesion, which unites the sulphuric acid with potash, to be equal to eight, the nitric acid tending to unite with that alkaline substance with a less degree of force, which may be estimated at seven, would be insufficient of itself to decompose the sulphat of potash, but the lime, by its tendency to combine with the sulphuric acid, aids it with a force which we may consider as equal to six, and these two forces together amount to thirteen, which sum of forces is exerted against eight, to separate the sulphuric acid from the potash. This compound force will also be greater than that by which the union between the lime and the nitric acid is maintained.

The best method of registering the cases of compound affinity is that of Bergman, improved by Mr Elliot, who added numbers expressive of the affinities of the various substances. Place the two compounds which mutually decompose one another between two braces directly opposite, the acids standing in opposition to the bases on which they act, between these four bodies note down the particular degrees of the attractive force which they exert upon each other, then add together the two horizontal numbers, expressing the quiescent attractions, and also the vertical numbers which are employed to mark the divellent attractions. If the sum of the latter exceed that of the former, a double decomposition and a double combination will be effected. An example of this from the last-mentioned compounds will afford a sufficient explanation.

Nitric, or Nitrat of Potash			
Potash	7	Nitric Acid	
Sulphate of Potash		Nitrat of Lime	
		Sulphuric Acid	Lime
		6	

## Sulphate of Lime

Here the quiescent affinities, or those subsisting between the sulphuric acid and the potash, and between the nitric acid and the lime =  $8 + 4 = 12$ . And the divellent affinities, or those which dispose the nitric acid to separate from the lime and unite with the potash, and unite with the lime =  $7 + 6 = 13$ . Consequently a double decomposition takes place, and two new compounds, nitrat of potash and sulphat of lime, are formed. The terms divellent and quiescent affinity were first employed by Kirwan.

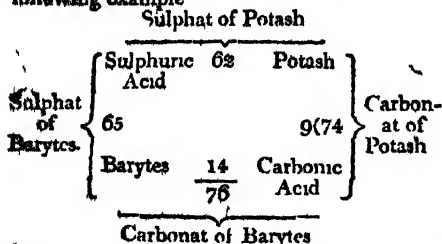


## A F F I N I T Y.

M. Guyton has proposed the following improvements in representing the cases of compound affinity.

When decomposition does not take place, nothing is to be written above and below the square.

When a new compound is precipitated, a line bent downwards in the middle is to be placed between it and the square, as in the following example



When a new compound is sublimed, the line between it and the square is to be pointed upwards in the middle, thus

When a new compound is partly dissolved and partly precipitated, the line placed between it and the square is to have the following shape

When it is partly dissolved and partly sublimed, the following line is to be used

The relative degrees of affinity, however, are not sufficiently known to enable us to express them accurately in numbers. Many attempts have been made, and different contrivances employed by Guyton, Fourcroy, Kluvan, and others, to ascertain these degrees, but hitherto without complete success: the tables they have formed are frequently erroneous, as the results of experiments are often very different from what the tables would lead us to expect, and sometimes even the direct contrary. As it is in cases of compound affinity that a knowledge of the exact ratios of affinities would be peculiarly useful, we earnestly hope that the continued researches of those chemists who have so ably investigated the subject will terminate in the attainment of so desirable an object.

**IV Disposing Affinity**, so called by Guyton, is the same as that which was before known by the term affinity of intermediates, the names have been given to it, because, by the addition of an intermediate substance, it disposes bodies to unite which would not otherwise have done it. Oil, for instance, does not combine with water, but a combination of oil with a salt constitutes a soap, which is soluble in water, the salt acting as an intermediate. In like manner, if sulphur be presented to oxygen gas, it does not manifest any affinity for it, but if it be previously combined with potash, it unites with oxygen very freely. In the same manner, if sulphur be united with potash, in this case, it will unite with oxygen.

Reciprocal Affinity takes place when a

compound consisting of two bodies is decomposed by a third, and the separated principle again decomposes the new combination; so that the principles seem to act reciprocally. The sulphuric acid has a greater affinity than the nitric acid with potash, and accordingly decomposes a combination of these two principles, but the nitric acid, when left in a separate state, has power to divide the sulphuric acid from the alkali, for by heating sulphat of potash with the nitric acid, nitre is again obtained. This kind of affinity is occasioned by two circumstances, the influence of which disturbs the general laws of chemical affinity. The common nitric acid must be warmed before it can decompose sulphat of potash, and the nitre obtained by this process is again decomposed by the sulphuric acid, as soon as the mixture returns to a cold state. As these apparent reciprocal affinities, however, depend upon certain combinations of caloric, light, the surrounding air, &c not hitherto sufficiently examined, their nature is, of course, but imperfectly understood.

**VI Resulting Affinity** is a term employed by Berthollet to denote the result of the action of several affinities on the same substance. Supposing the affinity of a compound body to result from those of the substances which compose it, he gives the following instance of this affinity: the nitric acid is composed of oxygen and azote, this acid combines with potash, and it acts upon potash by an affinity resulting from that of the oxygen and of the azote.

**VII Affinity of Aggregation** is that which unites the integrant particles of bodies of the same nature, it acts in opposition to the affinity of composition, of which we have been treating, and is likewise known by the term cohesion. See **COHESION AND AGGREGATION**.

After giving this view of the leading phenomena of chemical affinity, and of the laws by which it appears to be regulated, we must observe that, in some cases, these laws seem liable to certain variations, which arise from the influence of particular circumstances, such as the quantity of the substances, the temperature of the atmosphere, motion or rest, solution by water or fire, the state of aggregation proper to each body, the attraction of saline vegetation, &c. Bergman, by whom every part of chemistry, and this in particular, has been so much improved, has considered most of these circumstances with great attention, and has shewn how far they may be expected to vary the laws of affinity. From the several facts which he has collected on this subject, he concludes that their variations can be regarded only as exceptions, by no means sufficient to weaken the evidence on which the doctrine is founded. C. L. Berthollet, however, in his Researches respecting the Laws of Affinity, has observed so many deviations, and has investigated them all with so much minuteness and care, as to excite in his mind a doubt of the truth of Bergman's doctrine, which depends upon the absolute uni-

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formity of elective affinity, that is, on its being a constant force. Berthollet is of opinion that this is not the case, but that affinity not only produces different effects upon different objects and in different situations, but is itself a variable force, depending upon various circumstances for the absolute degree of its exertion, as well as for the quantity of its effect. His treatise on this subject is well deserving the consideration of every chemist. On the subject of the present article, consult also the words **ELECTIVE ATTRACTION**, **PRECIPITATION**, **SATURATION**, and **SOLUTION**, in this Dictionary, Fourcroy's Chemistry, vol I, Pearson on Elective Attractions, Kirwan on Mineral Waters, Kirwan on the Strength of Acids and the Composition of neutral Salts, Thomson's Chemistry, and the Supplement to the Encyclopedia Britannica, art Chemistry, part II chap 11.

**AFFIÖNE AFFIÖN** (*aphun*, or *ophun*, Arab.) Opium

To **AFFIRM** *v n* (*affirmo*, Lat.) To declare, to tell confidently opposed to the word *deny*

To **AFFIRM** *v a* To declare positively, to ratify or approve a former law or judgment

**AFFIRMABLE** *a* (from *affirm*) That may be affirmed (*Hale*)

**AFFIRMANCE** *s* (from *affirm*) Confirmation opposed to *repeal* (*Bacon*)

**AFFIRMANT** *s* (from *affirm*) The person that affirms, a declarer

**AFFIRMATION** *s* (*affirmatio*, Lat.) 1 The act of affirming or declaring opposed to *negation* (*Shakspeare*) 2 The position affirmed (*Hammond*) 3 Confirmation opposed to *repeal* (*Hooker*)

**AFFIRMATION**, in law, denotes an indulgence allowed to the people called Quakers who, in cases where an oath is required from others, may make a solemn affirmation that what they say is true, and if they make a false affirmation, they are subject to the penalties of perjury

**AFFIRMATIVE** *a* (from *affirm*) 1 That does affirm opposed to *negative* 2 That can or may be affirmed (*Newton*) 3 Positive, dogmatical (*Taylor*)

**AFFIRMATIVE**, in grammar Authors distinguish affirmative participles, such is, yes — The term affirmative is sometimes also used substantively, as, "the affirmative is the more probable side of the question" — "there were so many votes, or voices, for the affirmative," &c

**AFFIRMATIVE QUANTITY**, one which is to be added, or taken effectivly, or positively. In algebra such quantities are denoted by the character +, which is, therefore, called the affirmative sign. So + AB, + CD, are called affirmative quantities. The sign which distinguishes them, is now likewise used to signify addition, as in + 6 + 9 + 5, which denotes the sum of 6, 9, and 5, i e 20. When the sum of several affirmative quantities is exhibited by means of the sign, it is usual to omit it before the first quantity, as 12,  $a + b + c + d$ ,

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which denotes the sum of the positive quantities; *a, b, c*, and *d*

**AFFIRMATIVELY** *ad* (from *affirmative*) On the opposite side, not negatively (*Brown*)

**AFFIRMER** *s* (from *affirm*) The person that affirms (*Watts*)

To **AFFIX** *v a* (*affigo*, *affixus*, Lat.) 1

To unite to the end, to subjoin (*Rogers*) 2

To connect consequentially (*Hammond*)

**AFFIX**, in grammar, a participle added at the close of a word, either to diversify its form or alter its signification. We meet with affixes in the Saxon, the German, and other northern languages, but more especially in the Hebrew, and other oriental tongues. The Hebrew affixes are single syllables, frequently single letters subjoined to nouns, and verbs, and contribute not a little to the brevity of that language.

**AFFIXION** *s* (from *affix*) 1 The act of affixing 2 The state of being affixed

**AFFLATION** *s* (*afflo*, *afflatum*, Lat.) Act of breathing upon any thing

**AFFLATUS** literally denotes a blast of wind, breath, or vapour striking with force against another body. The word is Latin, formed from *ad to*, and *flare*, to blow. Naturalists sometimes speak of the afflatus of serpents. Tully uses the word figuratively, for a divine inspiration, in which sense, he ascribes all great and eminent accomplishments to a divine afflatus.

**AFFLATUS** (*ad* and *flo*, to blow) 1 A blast or vapour 2 A species of erysipelas

To **AFFLICT** *v a* (*afflicto*, *afflictum*, Lat.) To put in pain, to grieve, to torment (*Hooker*)

**AFFLICTEDNESS** *s* (from *afflicted*) The state of affliction, or being afflicted, sorrowfulness, grief

**AFFLICIER** *s* (from *afflict*) The person that afflicts

**AFFLICTION** *s* (*afflictio*, Lat.) 1 The cause of pain, or sorrow, calamity (*Hooker*)

2 The state of sorrowfulness, misery (*Addison*)

**AFFLICTIVE** *a* (from *afflict*) Painful, tormenting (*South*)

**AFFLUENCE**, **AFFLUENCY** *s* (*affluence*, Fr *affluentia*, Lat.) 1 The act of flowing to any place, concourse (*Watton*) 2 Exuberance of riches, plenty (*Rogers*)

**AFFLUENT** *a* (*affluens*, Lat.) 1 Flowing to any part (*Harvey*) 2 Abundant, exuberant, wealthy (*Prior*)

**AFFLUENTNESS** *s* (from *affluent*) The quality of being affluent

**AFFLUX** *s* (*affluxus*, Lat.) 1 The act of flowing to some place, affluence 2 That which flows to any place (*Harvey*)

**AFFLUXION** *s* (*affluxio*, Lat.) 1 The act of flowing to a particular place 2 That which flows from one place to another (*Bre*)

To **AFFORD** *v a* (*affoures*, *affourager*, Fr) 1 To yield or produce. 2 To grant, or confer any thing (*Brown*) 3 To be able to sell (*Addison*) 4 To be able to bear expences (*Sayst*)

**To AFFOREST**, *v a.* (*afforestation*, Lat.) To turn ground into forest (*Darke*)

**To AFFRANCHISE**, *v a.* (*affranchir*, Fr.) To make free.

**To AFFRAY**, *v a.* (*affrayer*, Fr.) To fright, to terrify: not in use (*Spenser*)

**AFFRAY**, *s* A tumultuous assault of one or three persons upon others

**AFFRICIA**, a kind of wafers used in ancient sacrifices

**AFFRICTION**, *s* (*afflictio*, Lat.) The act of rubbing one thing upon another (*Boyle*)

**To AFFRIGHT**, *v a.* (See **FRIGHT**) To affect with fear; to terrify (*Waller*)

**AFFRIGHT**, *s* (from the verb) 1 Terror; fear (*Dryden*) 2 The cause of fear, a terrible object, dreadful appearance (*Ben Jonson*)

**AFFRIGHTFUL**, *a* Full of affright or terror, terrible, dreadful (*Decay of Piety*)

**AFFRIGHTMENT**, *s* (from *affright*) 1 The impression of fear, terror (*Locke*) 2 The state of fearfulness (*Hammond*)

**AFFRODINA**, or **AFFRODITE** (*aphrodite*) Venus or Aphrodite, the chemical name of copper.

**To AFFRONT**, *v a.* (*affronter*, Fr.) 1 To meet face to face, to encounter (*Shakespeare*) 2 To meet in a hostile manner, front to front (*Milton*) 3 To offer an open insult; to offend avowedly (*Dryden*)

**AFFRONT**, *s* (from the verb) 1 Open opposition; encounter (*Milton*) 2 Insult offered to the face, contumely (*Dryden*) 3 Outrage; act of contempt (*Milton*) 4 Disgrace, shame (*Arbutnot*)

**AFFRONTÉE**, in heraldry, an appellation given to animals facing one another on an escutcheon, a kind of bearing otherwise called *confronté*, and stands opposed to *adoüé*

**AFFRONTER**, *s* (from *affront*) The person that affronts

**AFFROTING**, *particip a.* (from *affront*) The quality of affronting (*Watts*)

**AFFUJAGE**, in ancient customs, a right of cutting fuel-wood in a forest

**To AFFUSE**, *v a.* (*affundo*, *affusum*, Lat.) To pour one thing upon another (*Boyle*)

**AFFUSION**, the act of pouring some fluid on another body. Divines and church historians speak of baptism by affusion, which amounts to much the same with what we now call sprinkling

**To AFFY**, *v a.* (*affier*, Fr.) To betroth in order to marriage (*Shakespeare*)

**To AFFY**, *v n* To put confidence in, to put trust in; to confide not used

**AFGHANS**, are a people in India who inhabit a province of Cabul or Cabulistan, and have always been connected with the kingdoms of Persia and Hindostan. They boast of being descended from Sam the first king of Israel, of whose advancement to the royal throne they give an account which deviates widely from the truth. They say indeed that their great ancestor was raised from a flock of a shepherd, not from any princely

qualities which he possessed, but because his stature was exactly equal to the length of a rod which the angel Gabriel had given to the prophet Samuel as the measure of the stature of him whom God had destined to fill the throne of Israel. Saul, whose descent, according to some of them, was of Judah, and according to others of Benjamin, had, they say, two sons, Berkia and Irma, who served David, and were beloved by him. The sons of Berkia and Irma were Afghan and Usbec, who during the reigns of David and Solomon distinguished themselves, the one for his corporeal strength, and the other for his learning. So great indeed was the strength of Afghan, that we are told it struck terror even into demons and geni. This hero used frequently to make excursions to the mountains, where his progeny, after his death, established themselves, lived in a state of independence, built forts, and exterminated infidels. When the select of creatures (the appellation which this people gave to Mahomet) appeared upon earth, his fame reached the Afghans, who sought him in multitudes under their leaders Khalid and Abdul Respid, sons of Walid, and the prophet honouring them with this reception "Come, O Muluc, or Kings!" they assumed the title of Melic, which they retain to this day. The history, from which this abstract is taken, gives a long and uninteresting detail of the exploits of the Afghans, and of their zeal in overthrowing the temples of idols. It boasts of the following monarchs of their race who have sat upon the throne of Delhi: sultan Behlole, Afghan Lodi, sultan Secander, sultan Ibrahim, Shir Shah, Islam Shah, Adil Shah Sur. It also numbers the following kings of Gaur descended from the Afghan chiefs: Solaiman Shah Garzani, Beyazid Shah, and Kutb Shah; besides whom, their nation, we are told, has produced many conquerors of provinces. The Afghans are sometimes called Solaimani, either because they were formerly the subjects of Solomon king of Israel, or because they inhabit the mountains of Solomon. They are likewise called Patans, a name derived from the Hindi verb *Patna*, to rush, which was given to them by one of the sultans whom they served, in consequence of the alacrity with which they had attacked and conquered his enemies. The province which they occupy at present was formerly called Roh, and hence is derived the name of the Rohillas. The city which was established in it by the Afghans was called by them Pashwer or Pasher, and is now the name of the whole district. The sects of the Afghans are very numerous, of which the principal are, Lodi, Lohouni, Sur, Serwari, Yusufzai, Langush, Drazauzi, Khetti, Yasin, Khail, and Beloge. They are Musulmans, partly of the Sunni, and partly of the Shuck persuasion. Though they are great boasters, as we have seen, of the antiquity of their origin, and the reputation of their race, other Musulmans reject their claim, and consider them as of modern, and even base, extraction. This is probably a calumny, for it seems inconsistent

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with their attention to the purity of their descent—an attention which would hardly be paid by a people not convinced of their own antiquity. They are divided into four classes. The first is the pure class, consisting of those whose fathers and mothers were Afghans. The second class consists of those whose fathers were Afghans, and mothers of another nation. The third class contains those whose mothers were Afghans, and fathers of another nation. The fourth class is composed of the children of women whose mothers were Afghans, and fathers and husbands of a different nation. Persons who do not belong to one of these classes are not called Afghans. Such is the account of the Afghans published in the second volume of the Asiatic Researches. It was translated from a Persian abridgment of a book written in the Pushto language, and called The Secrets of the Afghans, and communicated by Henry Vansittart, esq to Sir William Jones, then president of the Asiatic Society. Their claim to a descent from Saul king of Israel, whom they called Melic Talut, is probably of not a very ancient date for the introduction of the angel Gabriel with his rod, gives to the whole story the air of one of those many fictions which Mahomet borrowed from the later rabbins. Sir William Jones, however, though he surely gave no credit to this fable, seems to have no doubt but the Afghans are descendants of Israel. “We learn (says he) from Esdras, that ten tribes, after a wandering journey, came to a country called Arsareth, where we may suppose they settled now the Afghans are said by the best Persian historians to be descended from the Jews. They have traditions among themselves of such a descent, and it is even asserted, that their families are distinguished by the names of Jewish tribes, although, since their conversion to Islam, they studiously conceal their origin from all whom they admit not to their secrets. The Pushto language, of which I have seen a dictionary, has a manifest resemblance to the Chaldaic, and a considerable district under their dominion is called Hazareh, or Hazaret, which might easily have been changed into the word used by Esdras. I strongly recommend an enquiry into the literature and history of the Afghans.” It is to co-operate with this accomplished scholar that we have inserted this short account of that singular people, and it is with pleasure that, upon the authority of Mr. Vansittart, we can add, that a very particular account of the Afghans has been written by the late Hafiz Rahmat Khan, a chief of the Mohillahs, from which such of our readers as are oriental scholars may derive much curious information.

**AFGHANISTAN**, the country of the Afghans, stretching from the mountains of ~~Tamary~~ to the Arabian sea, and from the Indus to the confines of Persia.

**AFIELD** *ad.* (from *a* and *field*) To the field (*Geog.*)

**AFRICA**. See **AFRICAN**

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**AFLAT**, *ad.* (from *a* and *flat*) Level with the ground (*Bacon*).

**AFLOAT**, *ad.* (from *a* and *float*.) Floating (*Addison*)

**AFOOT** *ad.* (from *a* and *foot*) 1. On foot; not on horseback (*Shakespeare*). 2. In action, as, a design is afoot (*Shakespeare*). 3. In motion (*Shakespeare*).

**AFORE** *prep.* (from *a* and *fore*) 1. Before, nearer in place to any thing 2. Sooner in time (*Shakespeare*)

**AFORE** *ad* 1. In time foregone or past (*Shakespeare*) 2. First in the way (*Shakespeare*) 3. In front, in the forepart (*Spens*).

**AFOREGOING** *part a* (from *afore* and *going*) Going before

**AFOREHAND** *ad.* (from *afore* and *hand*) 1. By a previous provision (*Geog. of Tongue*) 2. Provided, prepared, previously fitted (*Bacon*)

**AFOREMENTIONED** *a* (from *afore* and *mentioned*) Mentioned before (*Addison*).

**AFORENAMED** *a* Named before (*Peach*)

**AFORESAID** *a* Said before (*Bacon*)

**AFORETIME** *ad.* In time past (*Susan*).

**AFRAID** *particip a* (from the verb *af-ray*) Struck with fear, terrified, fearful (*Dryden*)

**AIRY** *ad.* (from *a* and *fresh*) Anew, again (*Watts*)

**AFRICA**, one of the four grand divisions of the globe, lies south of Europe, and west of Asia. It is bounded on the north by the Mediterranean, which separates it from the former, and by the Red sea on the NE. which divides it from Asia, to which it is joined by the isthmus of Suez. Its greatest length from north to south is 4600 miles, and its greatest breadth from east to west is 3500 miles, reaching from lat 37° N to 36° S and from lon 17° W to 50° E. The chief trade carried on by the Europeans, with the more savage African nations, is the purchasing or ~~carrying~~ off by force, whenever it is in their power, slaves for their colonies in other countries, and, because they have been remarkably successful in this iniquitous traffic, it has been asserted by interested men, that these barbarous nations are descended from Canaan, the son of Ham, whom Noah cursed, and prophesied that he should be a servant of servants of his brethren: and this is intended as a defence of their horrid system! a system which is now, to the eternal honour of the British, abolished among us. We do not yet know much of the interior parts of this vast region, and our little knowledge was much less previous to the information given us by Bruce, Vaillant, Park, and Brown. The principal rivers of Africa are, the Niger, the Senegal, the Gambias, the Laina, the Coanza, and the Nile the principal mountains are the Atlas, the mountains of the Moon, and the Sierra Leona. Besides the animals that we have in Europe, Africa produces others not so generally known, as lions, leopards, tigers, panthers, rhinoceroses, elephants, came-

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leons, vetches, camels, dromedaries, monkeys, buffaloes, and wild asses in the rivers, there are crocodiles and river horses. The most useful of these are the elephant, the camel, and the dromedary. Africa has many islands, on the east are, Madagascar, St Maurice, Bourbon, and Zecotora. On the west the isles of Madeira, the isles of Cape Verde, the Canary islands. The isles of Madeira are, Madeira, Porto Santo, and La Deserta. The Cape de Verde islands are, St Anthony, St Vincent, St Lucia, St Nicholas, St Jago, Sal, Mayo, Del Fuego, Brava, and Bonavista. The Cuinary islands are, Lancelota, Forteventura, Canaria, Tenerif, Gomera, Ferro, and Palma. There are other islands between this continent and South America, which are reckoned among the African islands, St Thomas, St Matthew, St Helena, Annobon, and Prince's isle.

**AFRICA**, or **MEHEDITA**, a sea port town of Tunis, on the Barbary coast, in Africa. Since the death of Mehedi, from whom this town received its latter name, it has often changed its masters, and been the occasion of much bloodshed. Lat 36 30 N Lon 11 10 E.

**AFRICAN MARIGOLD** See **TAGETES**

**AFRICAN RAGWORT** See **OTHONNA**

**AFRICAN COMPANY**, a society of merchants established by king Charles II for trading to Africa, which trade is now laid open to all his majesty's subjects, paying ten per cent for maintaining the forts.

**AFRICAN ASSOCIATION**, was formed in 1788 with a view of promoting the discovery of the interior parts of Africa. Mr Mungo Parke and others are now employed in this important work.

**AFRONT** *ad* (from *a* and *front*) In front, in direct opposition to the face (*Shakspeare*)

**AFSLAVERS**, persons appointed by the burghmasters of Amsterdam to preside over the public sales made in that city, acting as brokers or auctioneers do with us.

**AFT**, in the sea language, the same with *abaft*, i. e. behind, or near the stern of a ship.

**AFTER** *prep* (after, six) 1 Following in place (*Shakspeare*) 2 In pursuit of (*Samuel*) 3 Behind (*Newton*) 4 Posterior in time (*Dryden*) 5 According to (*Bacon*) 6 In imitation of (*Addison*)

**AFTER** *ad* 1 In succeeding time (*Bac*) 2 Following another (*Shakspeare*)

**AFTER** is compounded with many words, but almost always in its genuine signification.

**AFTERAGES** *s*, (from *after* and *age*) Successive times; posterity (*Halegh*)

**AFTER ALL** *ad* At last, in fine, in conclusion (*Atterbury*)

**AFTERBIRTH** *s*, (from *after* and *birth*) The secondine (*Wiccan*)

**AFTERLAP** *s* Unexpected event after an affair is supposed to be at an end (*Spenser*)

**AFTERCOST** *s* The expense incurred after the original plan is executed (*Mortimer*)

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**AFTERCROP** *s*. Second harvest (*Mort*)  
**To AFTEREYE** *v a* To follow in view (*Shakspeare*)

**AFTERGAME** *s* Methods taken after the first turn of affairs (*Wotton*)

**AFTERMATH** *s* (from *after* and *math*, from *more*) Aftercrop. The second crop or grass which springs up after mowing; or the grass cut after the corn. In the neighbourhood of London, the aftermath, when made into hay, is of considerable value. But in haying this crop, so as to render it wholesome for horses and cattle, great nicety is requisite, the nature of the aftermath being more soft and spongy than grass of the first growth. See **HAY** and **HUSBANDRY**

**AFTERNOON** *s* The time from the meridian to the evening (*Dryden*)

**AFTERPAINS** *s* Pains after birth

**AFTERPART** *s* The latter part (*Locke*)

**AFTERPROOF** *s* 1 Evidence posterior to the thing in question 2 Qualities known by subsequent experience

**AFTIRIASTE** *s* Taste remaining upon the tongue after the draught

**AFTIRHOUGHT** *s* Reflections after the act, expedients formed too late (*Dryden*)

**AFTIRTIMES** *s* Succeeding times (*Dryden*)

**AFTERWARD** *ad* In succeeding time (*Hooker*)

**AFTERWIT** *s* Contrivance of expedients after the occasion of using them is past (*L'Est*)

**AGELIA** In botany, a genus of the class and order decandria monogynia; thus distinguished calyx tubular, with a four cleft border, deciduous, petals four, with claws, the uppermost very large, two uppermost filaments barren, legume many-celled, seeds arilate at the base. The only known species is an African tree described by Dr F. Smith, in the Transactions of the Linnean Society.

**AGA**, in the Turkish language, signifies a great lord or commander. Hence the aga of the Janissaries is the commander in chief of that corps, as the general of horse is denominated spahichr aga. The former is an officer of great importance. We find also agas in other countries. The chief officers under the khan of Tartary are so called, and among the Algerines we read of agas.

**AGA CREPENSUM** (from *agn*, wild, Talm) The Spanish milk-thistle, a native of Crete.

**AGAGI FR**, a name given in Abyssinia to those whose business it is to hunt and kill elephants.

**AGAIN** *ad* (again, Saxon) 1 A second time, once more (*Bacon*) 2 On the other hand (*Bacon*) 3 On another part (*Dryden*) 4 In return 5 Back, in restitution (*Shakspeare*) 6. In recompence (*Proverbs*) 7. In order of rank or succession (*Bacon*) 8. Beside, in any other time or place (*Bacon*) 9 Twice as much (*Pope*) 10 Again and again, with frequent repetition, often (*Locke*) 11 In opposition to the answer

again 12 Back, as, returning, from some message

**AGAINST.** *prep.* (ægeon, Saxon) 1 In opposition to any person all are against him (*Genesis*). 2. Contrarily to, in opposition to, it is against his will (*Dryden*). 3 In contradiction to any opinion tracts against popery (*Swift*). 4. With contrary motion or tendency, against the stream (*Shakespeare*). 5 Contrary to rule; against law (*Milton*). 6. Opposite to, in place against the river's mouth (*Dryden*). 7 To the hurt of another the accident is against me (*Dante*). 8 In expectation of provided against the time (*Dryden*).

**AGALACTIA** (αγαλακτία, from a priv and γαλα, milk) A defect of milk after childbirth

**AGALACTOUS** (αγαλακτος) Destitute of milk

**AGALLACHI VERI LIGNUM** See **LIGNUM ALOES**

**AGALLOCHUM** (αγαλλοχον) The aromatic aloe

**AGALMATA**, in antiquity, a term signifying ornaments in a temple, as statues, &c

**AGAMEMNON**, king of Mycenæ and Argos, was brother to Menelaus, and son of Priamenes, the son of Atreus. Homer calls them sons of Atreus, which is incorrect, upon the authority of Hesiod Apollod &c. When Atreus was dead, his brother Thyestes seized the kingdom of Argos, and removed Agamemnon and Menelaus. Agamemnon married Clytemnestra, and Menelaus Helen, both daughters of Tyndarus king of Sparta, who assisted them to recover their father's kingdom, where Agamemnon established himself, at Mycenæ. Menelaus succeeded his father-in-law. When Helen was stolen by Paris, Agamemnon was elected commander in chief of the Grecian forces going against Troy. Their fleet was detained at Aulis, where Agamemnon sacrificed his daughter to appease Diana. During the Trojan war, Agamemnon behaved with much valour, but his quarrel with Achilles, whom mistresses he took by force, was fatal to the Greeks. Clytemnestra, with her adulterous Ægisthus, prepared to murder him on his return, and as he came from the bath, to embarrass him, she gave him a tunic whose sleeves were sewed together, and while he attempted to put it on, she brought him to the ground with the stroke of a hatchet, and Ægisthus seconded her blows. His death was revenged by his son Orestes.

**AGANIPIDES**, in ancient poetry, a designation given to the muses, from a fountain of mount Helicon, called Aganippe.

**AGANIPPE**, in antiquity, a fountain of Boetia at mount Helicon, on the borders between Phocia and Boetia.

**AGATHANTHUS** In botany, a genus of the class and order hexandria monogynia, with a funnel-shaped, funnel form, six parted, regular corolla. The only known species is a Cape

**AGAPE** *ad* (α and gape,) Staring with eagerness (*Spectator*).

**AGAPE** (αγαπη, agape, Heb) 1 Desire 2 A delicious banquet

**AGAPES, or AGAPÆ**, in church history, a kind of religious festival, celebrated in the ancient church, to keep up a harmony and concord among its members. The word is formed of the Greek αγαπη, love. St. Chrysostom describes this feast thus. Upon certain days, after partaking of the Lord's Supper, the Christians met at a common feast, the rich bringing provisions, and the poor, who had nothing, being invited, the ceremony ended with the kiss of charity. During the three first centuries, these love-feasts were held in the church without scandal and offence, but, in after-times, the heathens began to tax them with impurity. This led to some regulations and precautions and at length to their abolition at the council of Carthage, in the year 397. The Agapæ have been revived among some modern denominations of Christians, and with them have been restored the old calamities.

**AGAPITÆ**, in ecclesiastical history, a name given to certain virgins and widows, who, in the ancient church, associated themselves with, and attended on, ecclesiastics, out of a motive of piety and charity.

**AGARIC, AGARICUM, AGARICUS** In surgery (αγαριον, from αγαρια, a town in Asia, from which it was brought, or from Agrius, a river in Sumatra, now Malowonda.) Agaricus chirurgorum agaricus quereus. Agaric of the oak. Touchwood. Boletus. The boletus ignarius, aculeus, pulveratus levis, ponit tumorem of Linnæus. A fungus formerly much used by surgeons as an external styptic, but, in modern days, deservedly sunk into disesteem.

**AGARICUS AIBUS** In medicine, the boletus luteus of the pharmacopœias. The trochies, extracts and pills made from it, were formerly considered valuable in pulmonary consumption.

**AGARICUS CHIRURGORUM** See **AGARIC**

**AGARICUS MUSCARIUS** In medicine, the agaricus muscarius, stipitatus, lamellis dimidiatis solitarius, stipite volvato apice dilatato basi ovato of Linnæus. A fungus employed by foreign surgeons externally, as an escharotic in cases of strumous, phagedenic, or fistulous ulcers, but little used in England.

**AGARICUS, AGARIC** In botany, a genus of the class and order cryptogamia fungi, generically distinguished by gills underneath. It is one of the most extensive plants in botany, naturalists having enumerated upwards of three hundred species of it already, and probably there are many that have not yet been noticed. They may be divided into those, 1 With stem surrounded with a ring and curtain. 2 Stem with a curtain without a ring. 3 Stem ranged or annulate without wrapper. 4 Stem without ring or wrapper. 5 Cap funnel form or oblique. 6 Cap halved, stem



lateral 7 Smooth, membranous, or fleshy, cup and gills coriaceous 8 Smooth, tender, mostly pellucid, with the cap striate and plated, generally of an uniform colour 9 Tender; more or less transparent, partly dissolving into a black fluid, or furnished with black gills 10 Cap opaque, conic, gills sooty when old, and dissolving into a black sanies, stem hollow 11 Stalks Of these the common mushroom is the *campestris*, and belongs to 3 in the above arrangement

**AGARIC MINERAL** (See **CRETA**.) of which it forms the species named *equimosa*

**AGASI** *a* (from *agast*.) Struck with terror, starting with amazement (*Milton*)

**AGASYI** *US*, (*αγασυις*, from *αγασμαι* to be wonderful,) the name given by Dioscorides to the gum-ammoniac tree, from its supposed good qualities

**AGATHA**, (*αγαθα*, good,) a name of the achates or agate

**AGATE** See **ACHATES**

**AGATHODÆMON**, in mythology, a beneficent genius or demon

**AGATHOPHYLLUM** In botany, a genus of the class and order didcandaria monogynia, thus distinguished Calyx very minute truncate, petals six, inserted into the calyx drupe somewhat globular, nut half-five celled, one-seeded, kernel fish lobed The only known species is a native tree of Madagascar

**AGAVL** American aloe A genus of the class and order hexandria monogynia, with corol erect, superior, calyxless, filaments erect, longer than the corol There are seven species of this magnificent plant, all which are common to North or South America One or two of the species are also found in the hedges of Spain and Portugal

**AGE** *s* (*age*, Fr) 1 Any period of time attributed to something, as the whole, or part of its duration (*Shakspeare*) 2 A succession or generation of men (*Roscommon*) 3 The time in which any particular man, or race of men lived (*Pope*) 4 The space of a hundred years, a century 5 The latter part of life, oldness (*Prior*) 6 Maturity ripeness, full strength of life (*Dryden*) 7 (In law) In a man, the age of fourteen years, is the age of discretion, and twenty-one years is the full age A woman at twenty-one is able to alienate her lands (*Cowell*) By the Roman law different ages were ascertained for different purposes Thus the consular age, or that at which a person might hold the consulship, was the forty-third year The judiciary age, between the thirty and sixtieth year The military age, seventeen years The praetorian age, forty years The legitimate age, twenty-five year

**AGE** Among ancient physiologists the life or age of man was divided into six stages, pueritia or childhood extending from birth to the year in adolescence, or boyhood, to the year eighteen; juvenis, or youth, to the year thirty; virilis ætas, manhood, to fifty; senectus, old age, to sixty; decrepita ætas, decrepitude, to death

**Age of a Horse**, may be judged of by several

particulars, but the chief characters by which it is determined are found in the teeth, which are forty in number, namely, six great teeth both above and below, on each side called back-teeth, or grinders, six above and as many below in the front of his mouth, called fore-teeth, or gatherers, and four tusks, or tusches named butt teeth, which make just forty, but mares being in general without tusks, their teeth are but thirty-six in number A colt is foaled without teeth, but in a few days he puts out four which are called pincers or nippers, soon after, the four separators appear next to the pincers after which it is frequently three or four months before the next, called corner teeth, push forth These twelve colt's teeth in the front of the mouth continue without alteration, till the colt arrives at the age of two years or two years and a half, which circumstance renders it very difficult to avoid being imposed upon during that time, if the seller of the colt find it his interest to make the colt appear older or younger than he is in reality In this case you may judge with more certainty of his age by his coat, and the hair of his mane and tail, than by his teeth, for a colt of a year old has a rough supple coat, like that of a water spaniel, and the hair of his mane and tail feels like flax, whereas a colt of two years has a flat coat, and straight hair like an aged horse At about two years and a half, or three years of age, a horse begins to shed or change his teeth Those called the pincers, as they first made their appearance, are the first that fall out, so that when he rises three years, he has four horses and eight colt's teeth, which are easily distinguished, the former being larger, flatter, and of a yellower colour than the other, and streaked from the end quite down into the gum Further, these four horse's teeth, or pincers, have in the middle of their extremities a deep black hole or mark, whereas those of the colt are round and white When the horse comes nearly four years old, he loses his four separators, or middle teeth, and in room of them puts out four others, which follow the same rule as the former ones, called the pincers At five years old he changes the four corner, which are the last of his colt's teeth, and is afterwards called a horse During this his fifth year his four tusks make their appearance behind the others, and the lower ones frequently push forth, three or four months before the upper But whatever some may assert to the contrary, a horse that has the two lower tusks without the upper beginning to make their appearance may be judged under five years of age, unless the other teeth shew to the contrary, for some horses never put forth any upper tusks at all, though this is not very frequently the case The two lower tusks are one of the most certain signs that a horse is coming five years old, though his colt's teeth may not be all gone at the same time However unfair, it is no unfrequent thing for breeders and dealers in horses to pull out their colt's teeth, in order to make them appear older than they are in reality only four years old, but if

all the colt's teeth are gone, and there is no appearance of the lower tusks, you may be pretty sure that this trick has been played, though they sometimes make use of another artifice, to mislead your judgment, which is to beat the bars every day with a wooden mallet, in the place where the tusks are to appear, in order to make them seem hard, and as if the tusks were already nearly cut through. When a horse is full six years old, the two lower pincers fill up, and instead of the above-mentioned holes, only a black spot remains visible between six and seven the two middle teeth fill up in the same manner, and between seven and eight the corner teeth do the like, after which it is very difficult, if not impossible, to tell the exact age of a horse, though a good judge will seldom err a great deal notwithstanding a horse has no mark in his mouth. For the purpose of judging of a horse's age, by the teeth, after he has lost the mark, we must have recourse to the tusks and the situation of the teeth. In examining the tusks you must feel the inside of them with your finger, from the extremity quite down to the gum, and if they are pointed, flat, and have two small channels withinside, you may be certain that the horse is not more than nine or ten years old at most between eleven and twelve, the two channels are reduced to a single one, which, after twelve, is entirely obliterated, and the tusks feel as round withinside as they appear without. After this, there remains no other sign whereby to discover the horse's age, but the situation of the teeth. And here it is to be noted, that the longest teeth are not always a sign of the greatest age. For if they hang or push forward, though but of a moderate length, the animal is certainly very old, but if they meet perpendicularly let their length be never so great, it is an infallible sign that the horse is still young enough to perform a great deal of service. It will perhaps be needless to mention the tricks that are made use of in order to impress a false mark in a horse's mouth, by hollowing his teeth with a graver, and then burning a mark with a small hot iron (which is called bishoping) because those that are acquainted with the true mark will easily detect the cheat, by several other circumstances, such as the size and colour of the teeth, the length, roundness, and bluntness of the tusks, the colour of the false mark, which is considerably blacker than the true one, and deeper, and by several other visible tokens, which denote that a horse is far advanced in years. When the mark is gone, recourse may be had to the horse's legs, observing whether they be neat and good to his flank, whether it be well trussed, not too full or swallowed up, and likewise to his feet, and appetite, all of which will help to confirm the buyer in his judgment, and prevent his being imposed upon in respect to the age of any horse he may wish to purchase. In addition to the foregoing remarks, the following may not be altogether useless. There are in a young horse's mouth are always ~~four~~ and for so many distinct ridges, whereas

in an old horse they are lean, dry, and smooth, with little or no rising. The eye-pits in a young horse are generally well filled up with flesh, and look plump and smooth, but in an aged horse, quite the reverse is found to be the case, they appear sunk, and hollow, and make him look ghastly, and of a melancholy aspect. Grey horses, when very old, frequently turn white, thick ones are apt to grow grey over their eye brows, and sometimes all over their faces. All horses when very old sink more or less in their backs, and such as are naturally long or low backed grow so hollow with age, as to render it very difficult to fit them with a saddle. Many of the Spanish and Barbary horses, with some of the Flanders and Danish breed, come under this description. The joints of aged horses likewise grow so stiff, and their knees and hocks bend so much, that they are almost incapable of going down the smallest declivity without stumbling, notwithstanding the road is by no means rough or unpleasant, when once this comes to be the case with a horse, whatever merit he may have had formerly, he can be of but little service to his owner in future.

*Age of a hunting or race Horse,* should be five years before you train him in, for however common a custom it may be among sportsmen to hunt their horses at four years old, or sooner, it is a very bluntable one, since at that age a horse's joints are not full knit, nor is he come to his best strength or courage, the consequence of which is, that he is almost sure to be disabled from performing any matter of speed or toughness, beside the hazard which he runs in being put so young to severe labour, and meeting with strains, and putting out splints, spavins, curbs, and wind-galls. How often moreover do we see horses that have been thus injudiciously used, lose all their natural fire and spirit, and become melancholy, stiff, and rheumatic, having all the distempers of old age entailed upon them before they are arrived at their prime.

*Age of neat Cattle* The age of the ox, cow, and bull, is known by the teeth and horns. At the end of ten months they shed their first fore teeth, which are replaced by others, larger, but not so white, and in three years all the incisor teeth are renewed. These teeth are at first equal, long, and whitish, but as the animal advances in years they wear, become unequal and black. They also shed their horns at the end of three years, and these again are replaced by other horns, which like the second teeth continue till old age. The manner of the growth of these horns is not uniform, nor their pullulations equal. In the first year of their appearance, that is in the fourth of the animal's age, two small pointed horns make their appearance, neatly formed, smooth, and towards the head terminating by a kind of button. The following year this button moves from the head, being impelled by a horny cylinder, which, lengthening in the same manner, is also terminated by another button, and so on for the horns continue to grow during



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the life of the animal. These buttons become annular joints, which are easily distinguished in the horns, and by which the age may be easily ascertained, reckoning three years for the point of the horn, and one for each of the joints.

**Age of Sheep** Sheep in their second year have two broad teeth, in their third year four broad teeth before, in their fourth year six broad teeth, and in their fifth year eight broad teeth. After which the age of the sheep is uncertain till the teeth are either cast or worn down, both which are common signs of considerable age. At the end of one year, rams, sheep, and wethers, lose the two fore-teeth of the lower jaw, and are known to want the incisor-teeth in the upper jaw, at eighteen months the two teeth adjoining the former also fall out, and at three years being all replaced, they are even and pretty white. But with advancing age they become loose, blunt, and at length black. The age of the ram, and of all horned sheep, may also be known by their horns, which shew themselves in their very first year and often at birth, and continue to lengthen by the addition of a ring, annually, to the latest period of life.

**Age of Goats** This is ascertained by the same rules that apply to sheep, in regard to their teeth and horns.

**Age of the Moon**, the number of days elapsed since the last conjunction, or new moon. See **MOON**.

**AGED** *a* (from *age*) 1 Old, stricken in years (*Prior*) 2 Old applied to inanimate things (*Still*)

**AGEDLY** *ad* (from *aged*) After the manner of an aged person.

**AGEM**, (אגם *agun*, a lake Hebrew,) a name of the Persian lilac, so called because it grows about ponds and lakes.

**AGEM**, in Macedonian antiquity, was a body of soldiers, not unlike the Roman legion.

**AGENOGLANS**, **AGIAMOGLANS**, or **AZAMOGLANDS**, in the Turkish polity, are children purchased from the Tartars, or rused for the purposes of war (every third year, by way of tribute, from the Christians, tolerated in the Turkish empire).

**AGFN** *ad* (אגן *agan*, Sax.) Again, in return, in recompence (*Dryden*).

**AGENCY** *s* (from *agent*) 1 The quality of acting, the state of being in action (action (*Woodward*)). 2 Business performed by an agent (*Swift*).

**AGENDA**, with philosophers and divines, signifies the duties a man lies under in obligation to perform. We meet with this in opposition to the credenda, or things he is to believe.

**AGENDA**, among merchants, a term sometimes used for a memorandum-book, in which is set down all the business to be transacted during the days either at home or abroad.

**AGENDA**, among ecclesiastical writers, denotes the service or office of the church.

**AGENEIA**, (αγενεία, from *a neg* and *γενεω*, to procreate) Venerable impotency, inability to beget children. A term employed

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in Vogel's nosology, and correspondent with Cullen's anaphrodisia, and dyspermatusmus.

**AGENERIDA**, in ancient customs, denotes own lord, or one who has the absolute property and dominion of a thing.

**AGENHINE**, in our old writers, signifies a guest that has lodged at an inn for three nights, after which time he was accounted one of the family, and his host was responsible for his behaviour.

**AGENOIS**, in geography, a country of France, in the late province of Guenée, and present department of the Lot and Garonne, comprehending about 120 square leagues.

**AGLNT** *a* (αγεν, Lat.) That does act (*Bacon*).

**AGENT** 1 An actor, he that acts (*South*). 2 A substitute, a deputy, a factor (*Dryden*). 3 That which has the power of operating, or producing effects on another thing. In this sense, agents are either natural or moral. Natural agents are such inanimate substances, as have a power communicated to them by the author of nature to produce one sort of effect, while moral agents are rational creatures capable of performing several effects, or several kinds of actions, and of regulating those actions in conformity with a certain rule.

**AGENT**, in chemistry, signifies any substance capable of producing chemical action, or whose presence determines the combination or decomposition.

**AGENT AND PATIENT**, in law, a person who is at once the doer of a thing, and the party to whom it is done. Thus when a man who is indebted to another makes his creditor his executor, and dies, the executor may retain so much of the goods of the deceased as will satisfy his debt, by which means he becomes agent and patient; that is, the person who both pays and receives the debt.

**AGENTES IN REBUS**, one of the ranks of officers, in the court of the Constantinopolitan emperor, whose business was, to collect and convey the corn both for the army and household, carry letters and messages from court to all parts of the empire, regulate couriers, to make frequent journeys through the provinces, inspect any motions, disturbances, machinations, &c. and give early notice thereof to the emperor.

**AGER**, in Roman antiquity, a certain portion of ground allowed to each citizen.

**AGER** is also used, in middle-age writers, for what we now call acre.

**AGER**, (from *αγρος*, *wild*, uncultivated,) the soil or common earth.

**AGER CHYMICUS**, the ground of chemistry, a term used by chemists to denote water.

**AGER MINERALIUM**, the same as *ager chymicus*, and for the same reason water being equally the ground or basis of minerals.

**AGER NATURÆ**, the ground or field of nature. A term applied to the uterus, or womb.

**AGFRASIA**, (αγφρασία, from *a priv.* and *γενεω*, *old age*) Green, or immature old age.

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**AGERATUM**, in pharmacy (*αγερων*, from *αγριον* and *γενος*, old age, i. e. never old, or ever green.) *Balsamita fern* Eupatorium *incanum*. The herb sweet-maudlin, so called because its flowers preserve their beauty a long time. The *ageratum* of the pharmacopœias is the *achillea ageratum foliis lanceolatis, obtusis, acute serratis* of Linnaeus. It was formerly employed in hepatic or bilious cases.

**AGERATUM**. In botany, a genus of the class and order Syngenesia, polygamia equalis. Receptacle naked, seeds crowned with five chaffs, more or less awned, calyx oblong, and a double row of leaflets, florets four or five-cleft. There are three species, one native of South America, the other two of India.

**AGERATUS LAPIS**, (*ageratus* common or belonging to a field.) The lapstone used by cobblers. It was formerly employed in medicine as a powder gently astringent.

**AGES**, (from *αγος*, mischievous.) The palm or hollow of the hand, from its power of injuring.

**AGES OF THE WORLD**. Greek historians divided the time elapsed since the beginning of the world into three ages. 1. From the creation to the deluge, which they called the obscure or uncertain age, because the history of mankind is uncertain during that period. 2. The fabulous or heroic age, because of the fabulous exploits of their gods and heroes. It began with the Ogygian deluge, and continued to the first Olympiad, where the third or historical age commenced.—This division, however, it must be observed, holds good only with regard to the Greeks and Romans, who had no histories earlier than the first Olympiad; the Jews, Egyptians, Phœnicians, and Chaldees, not to mention the Indians and Chinese, who pretend to much higher antiquity, are not included in it. By the poets, however, the interval since the first formation of man has been divided into four ages, distinguished by the epithets of golden, silver, brazen and iron, according to the progressive increase of vice and depravity in the world, and the consequent decrease of happiness among mankind. In some ancient northern monuments, the rocky or stony age correspond to the brazen age of the Greeks, and the northern poets style the fourth age of the world the iron age. Among the Jews, the duration of the world is also divided into three ages. 1. The *seculum* *inane*, or void age, was the space of time from the creation to Moses. 2. The present age, denotes all the space of time from Moses to the coming of the Messiah, and, 3. The age to come, denotes the time from the coming of the Messiah to the end of the world. By some, the space of time commencing from Constantinian, and ending with the taking of Constantinople by the Turks in the fifteenth century, is called the middle age, but others date it from the division of the empire made by Theodosius at the close of the fourth century, and extend it to the time of the emperor Maximilian I. in the beginning of the sixteenth

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century, when the empire was first divided into circles.—The middle is by some denoted the barbarous age, and the latter part of it the lowest age. The several ages of the world may be reduced to three grand epochs, viz. the age of the law of nature, called by the Jews the void age, from Adam to Moses, the age of the Jewish law, from Moses to Christ, and the age of Grace, from Christ to the present time.

**AGESILAUS**, king of Sparta, of the family of the Agidae, was son of Doryssus, and father of Archelms. During his reign, Icyergus instituted his famous laws.—Son of Archidamus of the family of the Proclidae, in preference to his nephew Leotychides. He made war against Artaxerxes king of Persia with success, but in the midst of his conquests in Asia, he was recalled home to oppose the Athenians and Boeotians, who desolated his country. He defeated his enemies at Coronea, but sickness prevented the progress of his conquests, and the Spartans were beat in every engagement, especially at Icenetia, till he again appeared at their head. Though deformed with small of stature, and lame, he was brave, and a greatness of soul compensated all the imperfections of nature. When he went, in his eightieth year, to assist Iachus king of Egypt, the servants of the monarch could hardly be persuaded that the Lacedæmonian general was catering with his soldiers on the ground, bare headed, and without any covering underneath. Ag. thus died on his return from Egypt, after a reign of thirty six years, 362 B. C. and his remains were embalmed and brought to Lacedæmon.

**AGIUSTIA** (*αγιστια*, from *α* neg and *γυσ*, to taste.) A defect in the sense of taste. A genus of diseases named by Cullen classed locally under dyscrasias.

**AGGAD** is Jewish antiquity, an ingenious tale or story, of which kind there are many in the Talmud.

**AGGERATION** (from *ad* and *aggratio*, Lat.) The state of growing or uniting to another body (*Brown*).

**AGGER**, in ancient Latin writers, denotes the middle part of a military road, raised into a ridge, with a gentle slope on either side, to make a drain for the water, and keep the way dry.

**AGGER** is also used for the whole road, or military way.

**To AGGERATE** (from *aggero*, Lat.) To heap up.

**AGGERHUUS**, or **CHRISTIANA**, the largest diocese in the southern parts of Norway, and the principal and most considerable in the whole kingdom, being 300 miles long, and 120 miles broad.

**AGGERHUUS**, a considerable mountain fortress in the diocese of Aggerhuus. It is uncertain when this fortress was erected in 1310 it was besieged by duke Erich of Sweden, but without success. In 1567, the Swedish army besieged it for 18 weeks in vain, and in 1717, a fruitless attempt was again made upon it by

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the Swedes under Charles XII It is 30 miles N W of Frederickshall Lat 59 25 N Lon 10 20 E

To **AGGLOMERATE** *v a* (*agglomero*, Lat) To gather up in a ball, as thread

**AGGLUTINANTIA AGGLUTINANTS** (*agglutino*, to glue together) Applications medical or chirurgical that produce adhesion of parts to parts

To **AGGLUTINATE** *v n* (from *ad* and *gluten*, Lat) To unite one part to another (*Harvey*)

**AGGLUTINATION** *s* (from *agglutino*) Union & cohesion (*Wiseman*)

**AGGLUTINATIVE** *a* (from *agglutino*) That has the power of procuring agglutination (*Wiseman*)

To **AGGRANDIZE** *v a* (*aggrandiscer*, Fr) To make great, to enlarge to exalt (*Watts*)

**AGGRANDIZEMENT** *s* (*aggrandissement*, Fr) The state of being aggrandized

**AGGRANDIZER** *s* (from *aggrandize*) The person that makes great another

To **AGGRATE** *v a* (*aggrare*, Ital) To please, to treat with civilities not in use (*Spenser*)

To **AGGRAVATE** *v a* (*aggravo*, Ital) 1 To make heavy, in a metaphorical sense 2 To aggravate in accusation (*Milton*) 2 To make any thing worse (*Bacon*)

**AGGRAVATION** *s* (from *aggravate*) 1 The act of aggravating 2 The act of enlarging to enormity (*Addis*) 3 The extrinsecal circumstances, which increase guilt or misery (*Hammond*)

**AGGREGATE** *a* (*aggregatus* Lat) Framed by the collection of particular parts into one mass, body, or system (*Ray*)

**AGGREGATE** *s* The result of the conjunction of many particulars (*Glanville*)

**AGGREGATE**, in general denotes a body formed by the union of others of the same kind which are smaller, the whole sum of which combined is called the aggregate The minutest parts into which an aggregate can be imagined to be divided without decomposition, are called integrant particles, but the parts into which it is divided by decomposition, are called component parts or principles See **AGGREGATION**

**AGGREGATE FLOWER** (*aggregatus flos*, from *aggregare* to assemble or collect together) That which has some part of the fructification common to several florets Or, when several florets are so combined by the intervention of some part of the fructification, that taking away one of them destroys the uniformity of the whole This common bond is either the receptacle or the calyx The partial or component flower of the aggregate is called a floret or floret There are seven kinds of aggregate flowers 1 Umbellate or umbelled

2 Cymose or cymed 3 Compound 4 Aggregate properly so called, having a dilated receptacle, and the florets on peduncles as *senecio*, *kanutia*, *teasel*, *cephalanthus*, *globularia*, *stendron*, *protea*, *statice*, &c 5

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**Amentaceous** 6 **Glutinous**, as the *grasses*. **Spadiceous**, as the *palms*, also *calla*, *dracuncum*, *pothos*, *arum*, *zostera* Hence **aggregate** is the name of the forty-eighth order of plants, in *Linneus's* *Fragments of a Natural Arrangement*, in *Philos Bot* containing such vegetables as have their flowers properly aggregate

**AGGREGATE GLANDS** (*glandulae aggregatae*) An assemblage of glands lodged in the cellular coats of the intestines

To **AGGREGATE** *v a* (*aggrego*, Lat) To collect together, to accumulate, to heap many particulars into one mass (*Milton*)

**AGGREGATION** *s* (from *aggregare*) 1 Collection, or state of being collected (*Brown*) 2 The collection, or act of collecting many particulars into one whole (*Woodward*) 3 The whole composed by the concourance of many particulars, an aggregate

**AGGREGATION**, in chemistry, denotes the cohesion of parts of the same kind In order to have a clear idea of this term, and those relating to it we must attend to the difference between the constituent and the integrant parts of bodies The constituent parts are, properly speaking, the principles of bodies these are substances differing in nature from each other, which, by their union and mutual combination really constitute mixed bodies, which partake of the properties of their constituent part For example, the constituent parts of common salt are an acid and an alkali, which ought to be considered as the principles of this salt at least as its proximate principles (See **PRINCIPLES**) As this acid and alkali are what really constitute common salt and are the parts, to the union of which it owes its existence and properties it is evident that the constituent parts cannot be disunited from each other, without destroying and decomposing it so that after such a disunion, the salt will no longer exist but only the acid and the alkali of the salt, which are very different from the salt, and from each other On the contrary the integrant parts of bodies do not absolutely differ from each other nor do they differ, as to the nature and principles, from the body into whose mass they enter By the integrant parts of a body are to be understood the smallest molecules or particles into which this body can be reduced without decomposition We may conceive that a neutral salt, for instance common salt, may be divided into molecules still smaller and smaller, without any separation of the acid and alkali which constitute the salt, so that these molecules, however small, shall always be common salt, and possessed of all its essential properties In the same manner that we conceive that a body may be divided into its primary integrant molecules, without any change of its nature, or other alteration than a diminution of its bulk, so we may also easily perceive, that if these primary integrant molecules, which are all homogeneous and of the same nature, and which are supposed separated from each other, should

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be brought to unite and combine together, no new body, that is, a body of different nature, will result from this union, but only a more considerable mass of the same body that is to say, for instance, that if the primary integrant molecules were common salt, their reunion would still form common salt, only in a mass so much larger, as there is a greater number of these molecules united together. But it is the union of these homogeneous parts of these primitive integrant molecules, which modern chemists have called aggregation, and they have called aggregates, bodies considered as resulting from their primary integrant parts, in opposition to the mixed and compounds, which they have given to bodies considered as resulting from the union of their constituent parts, which are substances heterogeneous, and of different natures. The name of integrant parts, which has been given to those whose union forms aggregates agrees well with them, because, in fact, this union is a kind of addition or integration (if such a word may be used) of a certain number of parts of the same kind, whence results a sum, or a whole. It is very essential to observe on the subject of aggregation, that we should have a very false idea of it, and entirely opposite to chemical phenomena, if we understood by this word nothing but a simple juxtaposition of the integrant parts of bodies: for besides that, there must be a real adhesion and intimate union of these same parts with each other, so that they cannot be separated but by some force superior to that by which they are united. A heap of sand for example, if we consider the grains of sand as its integrant parts cannot be regarded as an aggregate, because these grains are only juxtaposed, and have no real adhesion together, so that the resistance which they oppose to their separation can only proceed from their gravity and is not the effect of adhesion or tendency to each other. In the second place it is necessary to observe on the subject of aggregation, that the force of adhesion of the integrant parts of different bodies varies much according to the nature of these bodies, some of them adhering very strongly and others very weakly, and that those which adhere well by are generally the easiest to be dissolved, considering that the solution of a body, or its combination with another body of a different nature, cannot be effected but so far as the integrant parts of these bodies are separated, or their aggregation is broken, which is partly done by the operations of art, but chiefly by the action of menstrua. Macquer's Chemistry Dict.

**To AGGRESS** *v a* (*aggreccion, aggressum, Lat*) To commit the first act of violence (*Prior*)

**AGGRESSION** *s* (*aggressio, Lat*) The first act of injury, commencement of a quarrel by some act of iniquity (*I'm strange*)

**AGGRESSOR** *s* (from *aggress*) The person that first commences hostility, the assaulter or invader (*Pope*)

**AGGRIEVANCE** *s* Injury, wrong endured.

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**To AGGRIEVE** *v a* (from *gravis, Lat*) 1 To give sorrow, to vex (*Spenser*) 2 To harass, to hurt in one's right (*Granv*)

**To AGGROUPE** *v a* (*aggruppare, Italian*) To bring together into one figure (*Dryden*)

**AGHAST** *a* (from *a* and *ghast, a ghost*) Struck with horror, as at the sight of a spectacle, stupified with terror (*Addison*)

**AGHUSTIA** See **ACRUSTIA**

**AGIASMA**, among ancient writers, signifies the whole church, and sometimes the more sacred part

**AGILD**, or **AGILDE**, in old law books denotes a person of so little account, that whoever killed him was liable to no fine for so doing

**AGILE** *a* (*agilis, Lat*) Nimble, ready, active (*Prior*)

**AGILNESS** *s* (from *agile*) Nimbleness, readiness for motion, quickness, activity

**AGILITY** *v* (*agilitas, Lat*) Nimbleness, quickness, activity (*Watts*)

**AGILARIUS**, in ancient law books, a keeper of a herd of cattle in a common field

**AGIMIR**, a country of Hindostan, bounded on the east by Agri, on the north by Delhi, on the south by Guzerat, and on the west by deserts which lie between it and the Indus. Its chief city, Agmir, is surrounded by high mountains, and lies in lat 26 4 N lon 75 40 E

**AGINCOURI**, or **AZINCOUR**, a village of France, in the department of the straits of Calis. The name will be ever memorable to an English ear on account of the complete victory which our Henry V gained there, with an army of 20,000 men, over an army of 60,000 Frenchmen. The battle was fought Oct 25 1415

**AGIO** in commerce, a term chiefly used in Holland and Venice, where it denotes the difference between the value of bank stock and the current coin. Money in bank is commonly worth more than specie thus, at Amsterdam, they formerly before the barbarous French invasion, gave 103 or 104 florins for every 100 florins in bank. At Venice, the agio was fixed at 20 per cent. The agio of the bank at Hamburg is about 14 per cent, which is the supposed difference between the good standard money of the state, and the clipped worn, and diminished currency poured into it from neighbouring states

**AGIOSMANDRUM**, a wooden instrument used by the Greek and other churches, under the dominion of the Turks to call together assemblies of the people. The word is compounded of *agios*, holy, and *mandrum*, I signify

**To AGIST** *v a* (*agiste, Fr*) a bed To take in and feed the cattle of other men at a certain rate (*Blount*)

**AGISTMENT**, or **AGISTATION**, in law, signifies the taking in other people's cattle to graze at so much per week. The term is peculiarly used for taking cattle to feed in the king's forests, as well as for the profits arising from that practice

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**AGISTMENT**, is likewise used in a metaphorical sense to signify any tax, burden, or charge. Thus the tax levied for repairing the banks of Romney marsh was called *agistmentum*.

**AGISTOR**, or **AGISTATOR**, an officer belonging to forests, who has the care of the cattle taken in to be grazed, and who levies the monies due on that account. They are generally called quest-takers, or gift-takers, and are created by letters patent. Each royal forest has four agistors.

**AGITABLE** *a* (*agitabilis*, Lat.) That may be put in motion.

**To AGITATE** *v a* (*agito*, Lat.) 1 To put in motion, to shake. 2 To agitate, to move (*Black mare*). 3 To affect with perturbation. 4 To stir, to discuss, to controvert (*Boyle*). 5 To contrive, to revolve (*Amg Charls*).

**AGILATION** *s* (*agitatio* Lat.) 1 The act of moving any thing (*Bacon*). 2 The state of being moved. 3 Discussion, controversial examination. 4 Perturbation, disturbance of the thoughts, violent motion of the mind (*Tatler*). 5 Deliberation, contrivance, the state of being consulted upon (*Swift*).

**AGITATION**, among philosophers, is chiefly used to denote an intestine commotion of the parts of any natural body. In this sense fire is said to agitate the minute particles of bodies. Fermentation and effervescence are also attended with a brisk agitation of the particles.

**AGITATOR** *s* (from *agitate*) He that agitates any thing, he who manages affairs.

**AGITATOR**, in antiquity, a term used for a charioteer, especially one who drove in the circus at the circus games.

**AGILATORS**, in the English history, certain officers set up by the army in 1647, to take care of its interests. Cromwell, after having joined the agitators, got them abolished.

**AGLAIÀ**, the name of the youngest of the three Graces, espoused to Venus.

**AGLIUS**, the poorest man of Arradit, pronounced by the oracle more happy than Cincinnatus of Tully.

**AGILI** *s* (*agilette*, Fr.) 1 A little of a point curved into the representation of an animal (*Hayw Shaks*). 2 The pendants at the ends of the chives of flower in tulips.

**AGLIDIA**, or **AGLI'THE'** (*αγλιδι, αγλιδη*, from *αγλίζω, to be offensive*) The clove, for heads of garlic, so called from their disagreeable smell.

**AGLUTITION** (*aglutio*, from *a* and *glutō, to swallow*) Difficulty of swallowing, or deglutition.

**AGMFN**, in antiquity, properly denotes a Roman army in march, in which sense it stands contradistinguished from *acies*, which denoted the army in battle array, though, on some occasions, we find the two words used indifferently for each other.

**AGMIAL** *a* (from *agmen*, Lit.) Belonging to a troop.

**JONDESHAM** See **AMERSHAM**.

**NAIL** *s* (from *ange*, grieved, and na-

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*gle, a-nail*) A disease of the nails, a whitening.

**AGNANTHEUS**, of Vaillant. See **CONNOTIA**.

**AGNATI**, in the Roman law, the male descendants from the same father.

**AGNATION**, in the civil law, the kinship, or relation, between the descendants of the same father, being males, and issued only from males. The word is formed from *ad*, to, and *asci*, to be born. Agnation differs from cognation, in that the latter is a universal name, under which the whole family, and even the agnate themselves, are contained, and agnation, a particular branch of cognation, which only includes the descendants in the male line. Again, agnation is properly only a civil name, as that of gens, or family, cognation, a natural name, or derived from blood.

**AGNEL**, an ancient French gold coin, worth about 12 sols, 6 deniers.

**AGNELLE**, an old French silver coin, worth about 20 sols.

**AGNESI** (Maria Giutana), an Italian lady, of very remarkable talents, and singularly extensive acquirements. We have not been able to procure accurate information as to the time of the birth and death of this celebrated female, but the particulars within our reach are so curious as to demand their insertion here. Donna Agnesi was the daughter of a creditable tradesman in Milan: we know not in what way she received her education, or whether the natural strength of her mind was much assisted by the great advantages derived from instruction: we find her, however, as early as her 18th or 20th year, much noted on account of her varied and profound attainments. She was universally spoken of as a kind of literary phenomenon and obtained, not by way of sneer, but of commendation, the appellation of the Walking Polyglot: she had acquired a prodigious knowledge, not merely of the modern languages of Europe, but of the learned and of the oriental languages. Besides this, she had obtained in mature acquaintance with the mathematical and philosophical sciences. While very young she composed a profound treatise of algebra, entitled *Analytical Institutions*, which, besides many eulogiums bestowed on her by several learned societies, gained her a professorship of mathematics in the university of Bologna. M. Montucla, speaking of this work, expresses himself thus: "We cannot behold without the greatest astonishment a person of a sex that seems so little fitted to tread the thorny paths of these abstract sciences, penetrate so deeply as she has done into all the branches of algebra, both the common and transcendental, or infinitesimal. These Institutions were published in 1749, and were so much esteemed that Mr. Professor Colson (the translator of sir Isaac Newton's *Fluxions*), was at the pains of learning the Italian language that he might be able to translate Agnesi's work. His translation remained unpublished till 1801, when it was given to the public by the rev. John Hellins, F.R.S. who was enabled to do this

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through the munificence of Mr Baron Mares. The work makes two handsome quarto volumes, and though it is now more than half a century since it was composed by Agnesi, it must still be reckoned a very useful, as well as ingenious performance, and proves manifestly that the same thus lady acquired was a tribute of strict justice. It is with regret, however, we add, that neither her inclination to these favourite intellectual pursuits, nor a desire of preserving and increasing the celebrity she had obtained, nor the intreaties of her father, could prevent her from dedicating herself to a monastic life amongst the nuns known by the name of the Blue Nuns. Thus, by a mistaken and indefensible self-denial (at least on protestant principles), was the learned world deprived of the useful improvements in literature which her genius and knowledge would have enabled her to communicate, not only on subjects of a mathematical nature, but on many others of a different kind in which she had become eminent. From the period of her retiring to the cloister, we conclude that her life was not chequered by any variety of incidents, other particulars respecting her we have sought in vain, nor have we been able to ascertain the time when death terminated the mortal existence of one of the brightest ornaments of the female sex.

**AGNI RS**, the denomination of a tribe or canton of Iroquois Indians, who vigorously and repeatedly resisted the French in their attempts to settle in Canada.

**AGNINA MEMBRANA** (from *agnus*, a lamb, and *membrana* a membrane) The amnion, one of the membranes which involve the fetus, so called by Actuarius from its tenderness and delicacy.

**AGNITION** *s* (from *agnitio*, I it) Acknowledgment.

**IO AGNIZI** *v a* (from *agnosco*, I it) To acknowledge, to own. obsolete (Shaks).

**AGNOLIA** (from *agnosco* I it *ignorant of*) In church history a sect of ancient heretics, who maintained that Christ considered as to his human nature, was ignorant of certain things, and particularly of the time of the day of judgment.

**AGNOMIN**, in Roman antiquity, a kind of fourth or honorary name, given to a person on account of some extraordinary action, virtue, or accomplishment.

**AGNOMINATION** *s* (*agnominatio* Lat.) Allusion of one word to another (Cicero).

**AGNUS CASTUS** (from *agnus* a lamb, whose fleece it embles the down upon this plant, and *castus*, chaste, because the chaste matrons at the feast of Ceres strewed its leaves and flowers upon their beds, and lay upon them) The virex agnus castus, foliis digitatis, serratis, spicis verticillatis of Linnaeus. Its seeds still form a part of the materia medica, possessing when fresh a fragrant odour, and an acrid aromatic taste.

**AGNUS DEI**, in the church of Rome a calt of wax stamped with the figure of a lamb supporting the banner of the cross. These being consecrated by the pope with great solemnity and distributed among the people, are supposed

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to have great virtues; as, to preserve those who carry them worthily and with faith, from all manner of accidents, to expel evil spirits, &c. The name literally signifies Lamb of God, this being supposed an image or representation of the Lamb of God who took away the sins of the world.

**AGO' ad** (*agan*, Sax) Past *is*, long ago, that is, long time has past since (*Addison*).

**AGOGE** *ad* In a state of desire (*South*).

**AGOGÉ**, in the ancient music, a species of modulation, wherein the sounds or notes proceed by continuous degrees of the scale, both rising and falling.

**AGORE** (*agwvyn*, from *agw*, to estimate) The deduction or reasoning upon diseases from their symptoms and appearances. The order, state or tenour of the corporeal or mental constitution.

**AGOING** *ad* (*a anlagang*) In action (*Jat*).

**AGONIPHIASIS** (*agoniphiasis*, *is f agwphic* and *gonaph*, compute) A looseness of the teeth.

**AGON**, in antiquity, a dispute or contest for the mastery, either in some exercise of the body, or of the mind. There were agones on certain days in most of the ancient feasts, and other ceremonies in honour of the gods, or heroes.

**AGON**, also signifies a minister in the heathen sacrifices, whose business it was to strike the victim.

**AGONIA** (*agwv*, from *a priv* and *gonos*, offspring) Henbane so called from its supposed tendency to produce barrenness.

**AGONIA** *ad* (*agin*, Sax) Ago, past (*Johnson*).

**AGONISM** *s* (*agwvismo*, Gr) Contention for a prize.

**AGONISTACAPITOLINI**, games celebrated every fifth year upon the Capitoline hill. Prizes were proposed for ability and strength, as well as for poetical and literary composition.

**AGONIA** (*agonia*, *agwvna*, from *a priv* and *gonos* an offspring) Sterility.

**AGONIA** (*agonia*, *agwvna*, from *agwvna*, to struggle) Agony, as when there is a struggle between life and death. Also fear and sadness of mind.

**AGONISMA** in antiquity, the prize given to the victor in a combat or dispute.

**AGONISTARCHA**, in antiquity, an officer much the same as the agonotheta.

**AGONISTIS** *s* (*agwvnis*, Gr) A prize-fighter, one that contends at a public solemnity for a prize (*Milton*).

**AGONISTICI**, in church history, those who publicly propagated the doctrines of Donatus.

**AGONISTIC**, that which relates to the combats or agones of the ancients. This word, among old physicians, signifies spring-water.

**AGONIUM**, the place where the agones were celebrated.

**TO AGONIZE** *v n* (*agoniser*, Fr) To feel agonies, to be in excessive pain (*Pope*).

**AGONOTHETA**, in Grecian antiquity.

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the president, or superintendent, of the sacred games

**AGONOUS**, (*agonus*, from *a priv* and *γῶν*, *offspring*) Barren In botany, not producing seeds or fruit

**AGONY** *s* (*αἰών*, Gr *agome*, Fr) 1 The pangs of death (*Roscommon*) 2 Any violent pain of body or mind (*Milton*) 3 It is particularly used in devotion for our Redeemer's conflict in the garden (*Hooker*)

**AGONYCLITE**, or **AGONYCLITES**, in church history, a sect of Christians, in the 7th century, who prayed always standing, as thinking it unlawful to kneel

**AGOOD** *ad* (*a* and *good*) In earnest (*Shaks*)

**AGORANOMUS**, an Athenian magistrate, who regulated weight and measures, the price of provisions, &c

**AGOUTY** *s* An animal of the Antilles, of the bigness of a rabbit, with bright red hair, and a little tail without hair (*Levaillant*)

**AGOWS**, in geography, the inhabitants of a province of Abyssinia, which is bounded by the mountains of Anud Anud on the east, by Bure and Unbirra, and the country of the Gongs on the west, by Damot and Gufit on the south, and by Dingleber on the north. There are two nations of the Agows, the one near the fountains of the Nile, called the Agows of Dunet, from their vicinity to that province, the other near the head of the Lacazzé, in the province of Iasta, called the Ichertatz Agows, from Icherta, a chief town, tribe, and district, near Iasta and Bezendir. The country of Agows lies in a very elevated situation, forming a kind of amphitheatre of lofty mountains, and the climate of course is temperate and wholesome. Many interesting particulars respecting the Agows are related in Bruce's Travels, vol. i. p. 401, and in p. 527.

**AGRA**, the principal kingdom of the Mogul empire in Asia. It abounds with oranges and lemons, besides rice, indigo and cotton. Its manufactures are white cloth, stuffs made of silk, silver and gold lace, &c. Its quota of force to the Mogul army is 15,000 horse, and 30,000 foot, and its revenue is computed at 3,000,000 sterling.

**AGRA**, the metropolis of the above kingdom, was founded by Eckbar in 1566, who called it Eckibat, and made it the seat of his empire. It is 300 miles N. E. of Surat. Lat. 26 43 N. Lon. 76 45 E.

*To AGRACE* *v a* (from *a* and *grace*) To grant favours to out of use (*Spenser*)

**AGRARIAN** *a* (*agrarius*, Lat) Relating to fields or grounds

**AGRARIAN LAWS**, among the Romans those relating to the division and distribution of lands, of which there were many, but that called the Agrarian law, by way of eminence, was published about the year of Rome 268, for dividing the conquered lands equally among all the citizens, and limiting the number of acres which each might enjoy. Agrarian law, either for dividing lands taken from the enemy, or of the public lands, or those purchased with public money, were easily passed, but those

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whereby private rich men were to be deprived of their lands, and the common people put in possession of what had been held by the nobility, were never attempted without great disturbance.—Several have pleaded for the necessity of agrarian laws among us, but, probably, none has entered so deeply into the subject as Harrington in his Oceana.

*To AGREASL* *v a* (from *a* and *grease*) To daub, to grease (*Spenser*)

*To AGREE* *v n* (from *agrée*, Fr) 1 To be in concord (*Pope*) 2 To yield to, to admit (*Burnet*) 3 To settle amicably (*Clarendon*) 4 To settle terms by stipulation (*Matthien*) 5 To settle a price between buyer and seller (*Matthieu*) 6 To be of the same mind or opinion (*Clarendon*) 7 To be consistent (*Mark*) 8 To suit with (*Locke*) 9 To cause no disturbance in the body (*Arb*)

*To ACREE* *v a* 1 To put an end to a variance (*Spenser*) 2 To make friends, to reconcile (*Roscommon*)

**AGREABLE** *a* (*agréable*, Fr) 1 Suitable to, consistent with (*Isaiah*) 2 Pleasing (*Addison*)

**AGREEABLENESS** *s* (from *agreeable*) 1 Consistency with, suitability to (*Locke*) 2 The quality of pleasing (*Collier*) 3 Resemblance, likeness (*Greene*)

**AGREABLELY** *ad* (from *agreeable*) Consistently with, in a manner suitable to (*Swift*)

**AGRI** *LD* *particip a* (from *agric*) Settled by contract (*Locke*)

**AGRIFORMITY** *s* (from *agree*) Consistency, suitableness

**AGREEMENT** *s* (*agreement*, French) 1 Concord (*Isaiah*) 2 Resemblance of one thing to another (*Locke*) 3 Compact, bargain (*Isaiah*)

**AGREEMENT**, in law signifies the consent of several persons to any thing done or to be done. It also denotes a kind of writing, or legal instrument by which the subscribing parties are bound to the performance of some specific act or covenant on certain terms and conditions therein specified. Written agreements are not valid unless legally stamped within a limited time.

**AGRIOSIO** (from *agri*, wild) 1 Verjuice, which is manufactured from the wild apple or crab. 2 The juice expressed from unripe grapes.

**AGRIA** (from *agri*, wild) 1 The holy 2 A malignant pustule.

**AGRIAMPIUS** (from *agri*, wild, and *ampos*, a vine) The wild vine.

**AGRICANTHA** (from *agri*, wild, and *ανθη*, a thistle) A species of *carduus sylvestris*, or wild thistle.

**AGRICOLA** (*Cnæus Julius*), an eminent Roman commander, was born A.D. 40. His father, Julius Gracinus, was a great orator, and was put to death by Caligula for refusing to plead against Silanus. Agricola was carefully brought up by his mother, Julia Procilla. He served first in Britain, and on his return to Rome, married a lady of rank. He was next made quaestor of Asia, and became tribune of the people, and prætor under Nero. In the



movements of 69, his mother was murdered, and her estate in Liguria plundered by the fleet of Otho. On his journey thither, he received the news of Vespasian's having assumed the government, and immediately exerted himself in his favour.—The twentieth legion having mutinied in Britain, he was sent thither to take the command, and to reduce them to obedience, in which he succeeded. After staying in Britain a considerable time, he returned to Rome, and was raised to the rank of patrician by Vespasian, who also made him governor of Aquitania, in Gaul. In 77, he was chosen consul with Domitian, and the same year married his daughter to Tacitus, the historian. Next year, he was appointed governor of Britain, where he soon restored tranquillity, and brought the natives to a love of the Roman language and manners. He extended his conquests into Scotland, and built a chain of forts from the Clyde to the Frith of Forth, to prevent the incursions of the inhabitants of the North. He defeated Gildgacus on the Grampian hills, and then made peace with the Caledonians. On the accession of Domitian to the imperial throne Agricola had a triumph decreed to him, and was recalled. He then went into retirement, and died August 23, A D 93, leaving a widow and one daughter. *Halkins*

**AGRICULTURI** See **HUSBANDRY** and **GARDENING**

**AGRICULTURAI** *a* Relating to agriculture

**AGRICULTURIST** *s* One who devotes his time and attention to the cultivation of the earth

**AGRIFOLIUM** (*αγριφύλλον*, from *αγριος* and *φυλλον*, the olive tree) The wild olive tree

**AGRIFOLIUM** (from *ακρίς*, a prickly and *φυλλον*, a leaf) *Agria* Holly. It should be rather *acifolium* from its prickly leaves

**AGRIGENTUM**, or **AGRAGAS**, in ancient geography, a very famous city on the south coast of Sicily, near the spot which is now occupied by Girgenti. The inhabitants of Agrigentum were corrupted and enfeebled by their idleness to luxury and pleasure, and fell a sacrifice to the power of their enemies. Timpe dockes attempted their reformation, and as Diogenes Laertius informs us, reproached them with devoting themselves every day to pleasure as if they were to die on the morrow, and with building their houses as though they were to live for ever. It is not easy to ascertain the precise time of the destruction of the old city, and the building of the new one.

**AGRIMONIA** Agrimony. A genus of the class and order didcandru dignum. Calyx five toothed, invested with an outer one petals five, inserted into the calyx, seeds two in the bottom of the calyx. There are five species, four of which are indigenous to Europe, and one, the *perioflora*, to North America.

**AGRIMONIA EUPATORIA** (called *eupatoria*, from *Eupator*, its inventor, or *quassilepatorium*, *ηρασσιον*, from *ηρας* the liver, because it is useful in diseases of the liver) The systematic name for the agrimonia of the pharmacopœias. See **ACRIMONY**

**AGRIMONT**, one of the Ladrone isles, about 42 miles in circumference Lat 19° 40' N Long 146° 0' E

**AGRIMONY** See **ACRIMONIA**

**ACRIMONY**, hemp See **EUPATORIUM**. **AGRIMONY**, bastard-hemp See **AGERATUM**

**AGRIMONY**, naked-headed-hemp See **VERBESINA**

**ACRIMONY**, water-hemp See **BIDENS**

**AGRIOCARDAMUM** (*αγριοκαρδαμυσ*, from *αγριο*, wild, and *καρδαμυς*, the nasturtium) Wild garden cress

**AGRIOCASTANUM** (*αγριοκαστανον*, from *αγριο* and *καστανον* chestnut) The pig-nut, or earth nut

**AGRIOCINARA** (*αγριοκιναρα*, from *αγριο*, and *κιναρα* an artichoke) The wild artichoke

**AGRIOCORCINIUM** (*αγριοκορκινιον*, from *αγριο*, wild, *κορκας*, a leech, and *μυλια*, an apple tree) The crab or wild apple

**AGRIOMILIA** the same is **AGRIOCORCINIUM** and from the same derivation

**AGRION** (*αγριον*) The herb hog's-fennel

**ACRION** A name given by Fabricius to certain species (constituting a tribe or family) of the libellula, or dragon fly. See **LIBELLULA**

**AGRIOPASINACA** (from *ager*, a field, and *pastinaca* a carrot) Wild carrot or purslane

**AGRIOPHAGI**, a name anciently given to those who fed on wild beasts

**AGRIOPHYLLUM** (*αγριοφυλλον*, from *αγριο*, and *φυλλον*, a leaf) Agri Hog's fennel, or peucedanum

**AGRIORIGANUM** (*αγριοριγον*, from *αγρι*, and *ριγον*, marjoram) Wild marjoram

**AGRIOSFINUM** (*αγριοσφινον*, from *αγριος* and *σφινον* parsley) Wild parsley

**AGRIOSIARI** (*αγριοσιαιρι*, from *αγριο*, and *σιαιρι* wild wheat) A species of wild corn

**AGRIPALMA** (*αγριπαλμα*, from *αγριο*, and *παλμα*, a palm-tree) The herb motherwort or wild palm

**AGRIPPAT** (Herod), was the grandson of Herod the great, and born A M 3997. He was brought up at Rome, and on his return to Judea was made by his grandfather governor of Iudæa, where he lived so extravagantly as to incur Herod's displeasure. He then went to Rome, and attached himself to Calpurnius the son of Germanicus, who succeeding Tiberius, made Agrippa tetrarch of Batanæa and Trachonitis, to which Claudius added the whole kingdom of Judea, with that of Chalcis. He commenced a persecution against the Christians to please the Jews, and put the apostle James the great to death. Being soon after at Cæsarea, he instituted games in honour of the emperor, at which the Tyrians waited on him to sue for peace. On this occasion Herod made a dreadful appearance on his throne at the theatre. Josephus says, his fine robe was richly wrought with silver, which reflected the rays of the rising sun with an unusual and almost insupportable splendour.



so that when he spake his flatterers exclaimed that it was the voice of a god and not of a man. Receiving this unpious adulation with pleasure, the historian Luke informs us, that "the angel of the Lord smote him, and he was eaten of worms (or vermin), and gave up the ghost." This happened in the year of Christ 44. Beza and Elsner think Luke's words may express the disease called morbus pedicularis, of which several persecuting and cruel princes have died. Josephus, probably, out of a partial fondness for Herod Agrippa, whom he had so much extolled, has concealed this particular, which was the true cause of those excruciating pains in the bowels of which both this Herod and his grandfather Herod the great died.

**AGRIPPA II** (Herod), son of the above, succeeded to the throne at the age of seventeen. St Paul pleaded his cause before him with so much eloquence, that Agrippa acknowledged that he had "almost persuaded him to be a Christian." He was greatly disliked by the Jews, and therefore resided chiefly at Rome, and died there about A.D. 94.

**AGRIPPE** Those children were formerly so called who were born with their feet smothered, because Agrippa, the Roman, was said to be so born.

**AGRIPPINIANS** in church history the followers of Agrippinus bishop of Carthage in the third century, who first introduced and defended the practice of rebaptization.

**AGROPHOLUS** (*αγροφολος*, from *αγρος*, wild) Wild, uncultivated, grows upon mountains.

**AGROSTEMMA** Corn cockle, or wild lichen. A genus of the Linnean class and order decandria pentagynia, thus generically distinguished. Calyx one leaved, coriaceous, petals five, with claws, the border obtuse and undivided; capsule superior, one-celled, with a five-toothed ostiole. There are four species: the *lythago*, or common field-cockle, which adds much to the beauty of our arable grounds, the *coronaria*, or rose campion, the *astro*, and the *caeli rosi*, all which are elegant ornaments to our flower gardens, but the last is merely an annual, though of great beauty.

**AGROSTIS** Bent grass. A genus of the Linnean class and order triandria digynia, thus characterised. Calyx two-valved, one flowered, the valves gentle, corol two-valved unequal, larger than the calyx, stigmas feathered. Of this grass there are at least forty six known species, of which eight are common to our own fields and hedges.

**AGROUND** *ad* (from *a* and *ground*) 1 Stranded, hindered by the ground from passing farther (*Keleigh*) 2 Hindered in the progress of affairs.

**AGRUMINA** (*quasi agnomina*, from *ag-* I seek, and *nomina* names)

**AGRYPNIA** (*αγρυπνια*) A privation of sleep, otherwise called watching, waking, *galea*, *pervigilium*, &c. In the Greek *h*, it is used for the vigil of any of the

greater feast-days, observed by the monks and clergy.

**AGRYPNOCOMA** (*αγρυπνια*, from *αγρυπνιος*, sleepless, and *κομα*, a lethargy) Coma vigil. A lethargic kind of wakefulness, in which the patient is stupidly drowsy, but cannot sleep.

**AGUAPE** (Indian) The Brazilian name of the white water-lily.

**AGUE**, a general name for all periodical fevers, which, according to the returns of the feverish pyrexism, are denominated tertian, quartan, or quotidian. See *FEBRIS INTERMITTENS*.

**AGUE TREE** See *LAURUS*.

**AGUED** *a* (from *ague*) Struck with an ague shivering (*Shakespeare*).

**AGUE-FIT** *s* (from *ague* and *fit*) The paroxysm of the ague (*Shakespeare*).

**AGUIA** (*αγυια*, from *a priv* and *αγος*, a member) Paralytic or organic imbecility.

**AGUIANEUE**, a form of rejoicing used among the ancient Franks on the first day of the year. The word is compounded of the French *a*, to, *qui*, misletoe, and *l'an neuf*, the new year. Its origin is traced from a Druid ceremony, in which the priests used to go yearly in December with them a sacred month to gather misletoe. The chief Druid climbing the oak, cut off the misletoe with a golden sickle, and the other Druids received it in a white cloth. On the first day of the year it was distributed among the people, after having been blessed and consecrated it by crying *au gui l'an neuf*, to proclaim the new year.

**AGUION** (Francis) was a Jesuit of Brussels, and professed of philosophy at Douay, and of theology at Antwerp. He was one of the first that introduced mathematical studies into Flanders. He wrote a large work on Optics, in six books, which was published in folio, at Antwerp in 1613, and a treatise of Projections of the Sphere. He promised also to treat upon Catoptrics and Dioptrics, but this was prevented by his death, which happened at Seville, in the year 1617.

**AGUIH** (from *ague*) Having the qualities of an ague (*Granville*).

**AGUIHNESS** *s* (from *aguish*) The quality of resembling an ague.

**AGUL** (from *agul*, a circle, Arab) The Syrian thorn so called on account of its plume and use in making bands.

**AGURAH**, a Jewish coin, being  $\frac{1}{10}$  of the silver shekel.

**AGUSADURA**, anciently a fee due from vassals to their lord, for sharpening their ploughing tackle.

**AGUSTINE**, an earth which forms, with acids, substances which are tasteless, as its name imports. It was discovered in the year 1800, by Trommsdorf, who found it in a mineral resembling the beryl. This earth resembles alumine, in not being acted on either by the fixed alkalis or ammoniac. It is not soluble in water, and by fire it acquires hardness, but no taste, and suffers no change in its solubility in acids. Supersaturated with phos-

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phonic acid it yields a salt of easy solubility, but its sulphat and acetate are very difficultly soluble.

**AGUTFOUEPA'OB** (Indian) Dart-wood, used by the Indians to cure wounds inflicted by arrows.

**AGY** (Indian) Pepper.

**AGYOL**, in antiquity, obelisks sacred to Apollo, placed in the vestibules of houses.

**AGYNEIA** In botany, a genus of the class and order monoclea monadclphia Calyx aux-leaved, corollless Male three anthers on the rudiment of a style Female, germ perforated at the top, without style or stigma. It is a native of China, and affords two species.

**AGYNIANI**, in church history, a sect who condemned all use of flesh, and marriage as not instituted by God, but introduced at the instigation of the devil. The word is compounded of the privative *a* and *γυν* woman. They are sometimes also called Agynncnses, and Agynni, and are said to have appeared about the year 694.

**AGYNOUS** (*αγνος*, from *a* priv and *γυνος*, a female) i e chaste, not having known woman.) Agnus castus.

**AGYRIA** (*αγρυια*, from *αγρις*, a crowd.) A quack or mountebank the doctor of the vulgar.

**AGYRTÆ**, in antiquity, a kind of fortune-tellers, who pretended to cure diseases, expiate the crimes of the dead, torment their enemies, &c.

**AH** *interject* 1 A word noting sometimes dislike and censure (*Isaiah*) 2 Sometimes contempt and exultation (*Psalms*) 3 Most frequently compassion and complaint (*Prior*)

**AHA' AHA'** *interject* A word intimating triumph and contempt (*Psalms*.)

**AHEFUIIA**, in zoology, a species of coluber, in the order serpents. Some authors call it the long green Bornea snake.

**AHASUERUS** See **ARTAXERXES I**.

**AHFID** *ad* (from *a* and *head*) 1 Further onward than another (*Dryden*) 2 Headlong, precipitantly (*LF* *strange*)

**AHEIGHT** *ad* (from *a* and *height*) Aloft, on high (*Shakspeare*)

**AHONAI** See **CERBERA**.

**A-HULL**, in the sea-language, the situation of a ship when all her sails are fuiled on account of the violence of the storm, and when, having lashed her helm on the lee-side, she lies nearly with her side to the wind and sea, her head being somewhat inclined to the direction of the wind.

**AI**, in zoology, the bradypus tridactylus of Linnæus, or sloth, with three-toed feet and short tail.

**AJATOCHTLI**, in zoology, a name given by Hernandez to the dasypus octocinctus, or eight-banded armadillo.

**AJAVIA** (Indian) A seed used in India as a remedy for the colic.

**AJAX**, son of Telamon, was the bravest of all the Greeks in the Trojan war after Achilles.

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He engaged Hector, with whom at parting he exchanged arms. After the death of Achilles, Ajax and Ulysses disputed their claim to the arms of the dead hero. When they were given to the latter, it is said, Ajax was so enraged, that he slaughtered a whole flock of sheep, supposing them to be the sons of Atreus, who had given the preference to Ulysses, and stabbed himself with his sword. The blood, which ran to the ground from the wound, was changed into the flower hyacinth. His body was buried at Sigæum, some say on mount Rhoetus. His tomb was visited by Alexander.

**AJAX**, the son of Oileus king of Locris, was surnamed Locrian, in contradistinction to the son of Telamon. He also went with forty ships to the Trojan war, as being one of Helen's suitors. According to Virgil, Menevæ, enraged at the violence offered by him to Cassandra on the night Troy was taken, seized him in a whirlwind, and dashed him against a rock, where he expired, consumed by thunder.

**AJAX**, in antiquity, a furious kind of dance, representing the madness of that hero, after his defeat by Ulysses.

**AJAX** in entomology, a species of the papilio eques, being the papilio marcellus of Cramer.

**AJAX**, in conchology, a variety of the murex campas of Gmelin's Linnean system, called also rubeta.

**AICHSTADT**, or **LICHSTADT**, a city of Germany, in the circle of Franconia, the capital of a district of the same name. Lat 48 57 N Long 11 10 E.

**To AID** *a* (*aider*, Fr.) To help, to support to succour (*Roscommon*)

**AID** *s* (from the verb) 1 Help, support (*Pope*) 2 The person that gives support, a helper, an auxiliary (*Politi*) 3 A subsidy, money granted (*Cowell*)

**AID** in law, denotes a petition made in court to call in help from another person who has interest in land, or any other thing contested.

**AID-DE-CAMP**, in military affairs, an officer employed to receive and carry the orders of a general.

**AID**, *auxilium*, in ancient customs, a subsidy paid by vassals to their lord on various occasions, as when he was about to purchase new land, &c.

**AIDANCL** *s* (from *aide*) Help, support little used (*Shakspeare*)

**AIDANT** *a* (*aillant*, Fr.) Helping, helpful not in use (*Shakspeare*)

**AIDER** *s* (from *aide*) He that brings aid, a helper, an ally (*Bacon*)

**AIDLESS** *a* (from *aide*) Helpless, unsupported, undefended (*Milton*).

**AIDS**, in the manege, are helps, or assistances, by which the horseman contributes towards the motion, or action, required of the horse. they commonly imply a discreet use of the bridle, cavesson, spur, pommel, rest, calf of the leg, and voice, and also a just and well-timed motion of the body.

**AIGINE** (from *aig*, a goal) The same as **CAPRIFOLIUM**  
**AIGITHALUS** See **PARUS**, or **TITMOUSE**

**AIGRETTE**, in zoology, a name given by Buffon to the *simia aygula*. The same author likewise applies the name in ornithology, to different species of ardea

**AIGUISCE**, in heraldry, denotes a cross with its four ends sharpened, but so as to terminate in obtuse angles. It differs from the cross fitchee, in as much as the latter tapers, by degrees to a point, and the former only at the ends

**AIGULI T s** (*aigulet*, Fr) A point with tags (*Spenser*)

**AIKMAN** (William,) a Scotch punter, was the only son of William Aikmal, esq. of Cairney, advocate, by Margaret, sister of sir John Clerk, of Penningh, bart and born October 24, 1682. He was educated with a view to the Scottish bar, but he soon abandoned the law, and devoted himself to painting. In 1707, he went to Italy, and after studying three years, visited Turkey, from whence he returned to Rome, and remained there till 1712, when he set out for his own country. In 1723, he removed to London, under the patronage of the duke of Argyll. He painted many excellent pieces for some of the English nobility, chiefly portraits. He died June 4th, 1731. Among the most intimate friends of Mr Aikman, were Somerville, Mallet, Allen Ramsay, and Thomson, each of whom paid an elegiac tribute to his memory. Thomson's poem closes with the following beautiful lines

"A friend, when dead, is but removed from sight,

Sunk in the lustre of eternal light

And when the parting storins of life are o'er,

May yet rejoice us on a happier shore

As those we love decay, we die in part,

Strug after string is severed from the heart,

Till loosen'd life, at last, but breathing clay,

Without one pang is glad to fall away

Unhappy he who latest feels the blow,

Whose eyes have wept o'er every friend laid low,

Dragg'd long ring on from partial death to death,

Till dying, all he can resign is breath

To **AIL** *v a* (ezlan, Saxon) 1 To pain, to trouble, to give pain (*Gen*) 2 To affect in any manner (*Dryden*)

**AIL** *s* (from the verb) A disease (*Pope*)

**AIL ANTHUS**. In botany, a genus of the class and order polygamia monoecia, of which the following is its generic character. Herin Calyx five-parted; corol five-petalled stamens two or three. Male, stamens ten. Female, styles lateral, curved inward, capsules from three to five, membranaceous, one-seeded. The only known species of this tree is a native of China, of about forty feet in height.

**AILE**, in law, a writ which lies where a

person's grandfather or great grandfather was seized of lands, &c in fee-simple, the day that he died, and a stranger abates and enters the same day, and dispossesses the heir of his inheritance

**AILLSBURY**, or **AYLESBURY**, the largest and most populous town in Buckinghamshire, having a market on Saturday. This town shares the assizes with Buckingham. It also sends two members to parliament. Lat 51 45 N Long 0 42 W

**A'ILING** part a Sickly, full of complaints

**AII MENT** *s* (from *ail*) Pain, disease (*Swift*)

To **AIM** *v n* (*esmer*, Fr) 1 To direct a missive weapon, as to a mark (*Pope*) 2 To point the view, or direct the steps, toward any thing to tend toward, to endeavour to reach or obtain (*Ilollston*) 3 To guess

To **AIM** *v a* To direct the missile weapon, to point the weapon by the eye (*Dryden*)

**AIM** *s* (from the verb) 1 The direction of a missive weapon (*Dryden*) 2 The point to which the thing thrown is directed (*Shakespeare*) 3 A purpose, an intention, a design (*Pope*) 4 The object of a design (*Locke*) 5 Conjecture, guess (*Shakespeare*)

**AINSWORTH** (Robert,) was born at Woodgate near Manchester, in September 1660, and was educated at Bolton in Lancashire. For a short period he kept a school at Bolton but afterwards went to London, and opened a considerable academy at Bethnal-green. From thence he removed to Hackney, and afterwards to other places near London, where he taught with good reputation for many years. Having acquired a moderate fortune, he declined this business, and after living privately a few years, died in April 1743, aged 83 years. He published a short treatise of Grammatical Institutions but is more known on account of his excellent Thesaurus, or Latin and English Dictionary. This work has gone through various editions under the superintendence of Patrick and Morell, the latter of whom published a useful abridgment in octavo

**AIR** *s* (*air* Ir *uer*, Iat) 1, The element encompassing the terraqueous globe (*Watts*) 2 The state of the air, or the air considered with regard to health (*Bacon*) 3 Air in motion, a small gentle wind (*Milton*) 4 Scent, vapour (*Bacon*) 5 Any thing light or uncertain (*Shakespeare*) 6 The open weather, air unconfined (*Dryden*) 7 Vent, emission into the air (*Dryden*) 8 Publication, exposure to the public view and knowledge (*Pope*) 9 Music, whether light or serious (*Pope*) 10 Poetry, a song (*Milton*) 11 The mien, or manner, of the person (*Addison*) 12 An affected or laboured manner of gesture (*Swift*) 13 Appearance (*Pope*). Upon some of these acceptations it will be necessary to speak much more particularly, as below

**AIR**, in natural philosophy and chemistry, a general term used to denote such invisible and

exceedingly rare fluids as possess a very high degree of elasticity, and are not condensable into a visible fluid state by any degree of cold we are acquainted with. By this last circumstance air is distinguished from vapour, which is condensable by cold. This term was originally, and for a long time peculiarly, applied to the air of which our atmosphere is composed, and in this sense we shall here consider it. The different kinds of air, now comprehended under the general term gas, which the researches of chemistry have discovered, will be mentioned farther on, and references made to those terms by which they are expressed in the nomenclature now adopted, and under which distinct accounts of them are given.

AIR, ATMOSPHERIC, is an invisible, insipid, inodorous, heavy, and elastic fluid, possessing great mobility, susceptible of rarefaction and of condensation, it surrounds the terrestrial globe to a certain height, the entire mass constituting the atmosphere. The consideration of this fluid must excite a very lively interest, since it is the depository of the signs of our thoughts and our affections, at the same time that it serves for the preservation of life in every animated being. Its physical and its chemical properties will successively fix our attention.

#### 1 *Physical Properties of Air*

The most important physical or mechanical properties of air, are its fluidity, its weight, and its elasticity.

1 *Its Fluidity*—The great fluidity of the air is manifest from the great facility with which bodies traverse it, as in the propagation of sound, and easy conveyance it affords to sounds, odours and other effluvia and emanations that escape from bodies. For these effects prove that it is a body whose parts give way to any force, and in yielding are easily moved amongst themselves, which is the definition of a fluid. That the air is a fluid is also proved from this circumstance, that it is found to exert in equal pressure in all directions, an effect which could not take place otherwise than from its extreme fluidity. Neither has it been found that the air can be deprived of this property, whether it be kept for many years together confined in glass vessels, or be exposed to the greatest natural or artificial cold, or condensed by the most powerful pressure, for in none of these circumstances has it ever been reduced to a solid state.

2 *Its Weight or Gravity*—The weight or gravity of the air, is a property belonging to it as a body, for gravity is a property essential to matter, or at least a property found in all bodies. But independent of this, we have many direct proofs of its gravity from sense and experiment thus, the hand laid close upon the end of a vessel, out of which the air is drawn at the other end, soon feels the load of the incumbent atmosphere; thus also, thin glass vessels, exhausted of their air, are easily crushed to pieces by the weight of the external air. Again, if a tube closed at one end, be filled with quicksilver, and the open end be immersed in a basin

of the same fluid, and so held upright, the quicksilver in the tube will be kept raised up in it to the height of about thirty inches above the surface of that in the basin, being supported and balanced by the pressure of the external air upon that surface and that this is the cause of the suspension of the quicksilver in the tube, is made evident by placing the whole apparatus under the receiver of an air-pump, for then the fluid will descend in the tube in proportion as the receiver is exhausted of its air, and then on gradually letting in the air again, the quicksilver reascends to its former height in the tube and this is what is called, from its inventor, the Torricellian experiment. Nay farther, air can actually be weighed like any other body, for a rigid vessel, full even of common air, by a nice balance is found to weigh more than when the air is exhausted from it, and the effect is proportionally more sensible, if the vessel be weighed full of condensed air, and more still if it be weighed in a receiver void of air.

But although we have innumerable proofs of the gravitating property of the air, yet the full discovery of the laws and circumstances of it are certainly due to the moderns. It cannot indeed be denied that several of the ancients had some confused notions about this property: thus Aristotle says that all the elements have gravity, and even air itself, and as a proof of it, says that a bladder inflated with air, weighs more than the same when empty, and Plutarch and Stobæus quote him as teaching that the air in its weight is between that of fire and of earth, and farther, he himself treating of respiration, reports it as the opinion of Empedocles, that he describes the cause of it to the weight of the air, which by its pressure forces itself into the lungs and much in the same way are the sentiments of Asclepiades expressed by Plutarch who represents him as saying, among other things, that the external air, by its weight, forcibly opened its way into the breast. But nevertheless it is certain, however unreasonable it may seem, that Aristotle's followers departed in this instance from their master, by asserting the contrary for many ages together. Indeed several of the phenomena arising from this property, have been remarked from the highest antiquity. Many centuries since, it was known that by sucking the air from an open pipe, having its extremity immersed in water, this liquid rises above its level, and occupies the place of the air. In consequence of such observations, sucking pumps were contrived and various other hydraulic machines, as Heron's syphons, described in his *Spiritual* or *Pneumatic*, and the watering-pots known in Aristotle's time under the name of clepsydre, which alternately stop or run as the finger closes or opens their upper orifice. Indeed the reason assigned, by philosophers many ages after, for this phenomenon, was a pretended horror that nature conceives for a vacuum, which, rather than endure it, makes a body ascend contrary to the powerful solicitation of its gravity.

Galileo was well apprised of the weight of

the air as a body in his Dialogues he shews two ways of demonstrating it, by weighing it in bottles, the transition was easy from one discovery to another yet still Galileo's knowledge of the matter was imperfect, that is, as to the particular instance of the suspension of a fluid above its level, by the pressure of the external air.

At length Torricelli fell upon the lucky guess, that the counterpoise which keeps fluids above their level, when nothing presses upon their internal surface, is the mass of air resting upon the external one. He discovered it in the following manner. In the year 1643, this disciple of Galileo, on occasion of executing an experiment on the vacuum formed in pumps, above the column of water, when it exceeds 34 feet, thought of using some heavier fluid, such as quicksilver. He conceived that whatever might be the cause by which a column of water of 34 feet high is sustained above its level, the same force would sustain a column of any other fluid, which weighed as much as that column of water, on the same base, whence he concluded that quicksilver, being about 14 times as heavy as water, would not be sustained higher than 29 or 30 inches. He therefore took a glass tube of several feet in length, sealed it hermetically at one end, and filled it with quicksilver, then inverting it, and holding it upright, by pressing his finger against the lower or open orifice, he immersed that end in a vessel of quicksilver, then removing his finger, and suffering the fluid to run out, the event verified his conjecture, the quicksilver, faithful to the laws of hydrostatics, descended till the column of it was about 30 inches high above the surface of that in the vessel below. And hence Torricelli concluded that it was no other than the weight of the air incumbent on the surface of the external quicksilver, which counterbalanced the fluid contained in the tube.

By this experiment Torricelli not only proved, what Galileo had done before, that the air had weight, but also that it was its weight which kept water and quicksilver raised in pumps and tubes, and that the weight of the whole column of it was equal to that of a like column of quicksilver of 30 inches high, or of water 34 or 35 feet high but he did not ascertain the weight of any particular quantity of it, as a gallon, or a cubic foot of it, nor its specific gravity to water, which had been done by Galileo; though to be sure with no great accuracy, for he only proved that water was more than 400 times heavier than air.

Torricelli's experiment became famous in a short time. Father Merenne, who kept up a correspondence with most of the literati in Italy, was informed of it in 1644, and communicated it to those of France, who presently repeated the experiment. Messrs Pascal and Bore made it first, and varied it several ways, which gave occasion to the ingenious treatise which Pascal published at twenty-three years of age, entitled *Expériences Nouvelles touchant la Vaine*. In this treatise indeed he makes use of

the old principle of *fuga vacui*, but afterwards getting some notion of the weight of the air, he soon adopted Torricelli's idea, and devised several experiments to confirm it. One of these was to procure a vacuum above the reservoir of quicksilver, in which case he found the column sink down to the common level but this appearing to him not sufficiently powerful to dissipate the prejudices of the ancient philosophy, he prevailed on M. Perier, his brother in law, to execute the famous experiment of Puy-de-Domme, who found that the height of the quicksilver half-way up the mountain was less, by some inches, than at the foot of it, and still less at the top so that it was now put out of doubt that it was the weight of the atmosphere which counterpoised the quicksilver.

Descartes too had a right notion of this effect of the air, to sustain fluids above their level, as appears by some of his letters about this time, and some years before; and in one of those he lays claim to the idea of the Puy de Domme experiment.

A quantity of air was next weighed by Merenne in a very ingenious manner. But Mr Boyle, by a more accurate experiment, found the proportion to be that of 938 to 1. And Mr Hawksbee found it is 850 to 1, proceeding on the same principles as Merenne, with a three-gallon glass bottle but extracting the air out of it with the air-pump instead of expelling it by fire, the height of the barometer being at that time 29.7 inches. Also by other accurate experiments made before the Royal Society by Mr Hawksbee, Dr Halley, Mr Cotes, and others, the proportion was always between 800 and 900 to 1, but rather nearer the latter, namely, being first found as 840 to 1, then as 852 to 1, and a third time as 860 to 1 the barometer then standing at 29.1 inches, and the weather warm. Mr Cavendish determines the ratio 800 to 1, the barometer being 29.3, and the thermometer at 50°, and Sir George Shuckburg, by a very accurate experiment, finds it 836 to 1, the barometer being at that time at 29.27, and the thermometer at 51°. And the medium of all these is about 832 or 833 to 1, when reduced to the pressure of 30 inches of the barometer, and the mean temperature 55° of the thermometer. Upon the whole therefore it may be safely concluded that, when the barometer is at 30 inches, and the thermometer at the mean temperature 55°, the density or gravity of water is to that of air, as 833.4 to 1, that is as  $\frac{2100}{2.52}$  to 1, or as 2500 to 3, and that for any changes in the height of the barometer, the ratio varies proportionally, and also that the density of the air is altered by the  $\frac{1}{470}$ th part for every degree of the thermometer above or below temperature.

This number, which is a very good medium among them all, we have chosen with the fraction  $\frac{1}{4}$ , because it gives exactly 11 ounces for the mean weight of a cubic foot of air, the weight of the cubic foot of water being just 1000 ounces averdupois, and that of quicksilver equal to 13600 ounces.

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*Air*, then, having been shewn to be a heavy fluid substance, the laws of its gravitation and pressure must be the same as those of water and other fluids; and consequently its pressure must vary with its perpendicular altitude. Which is exactly conformable to experiment, for on removing the Torricellian tube to different heights, where the column of air is shorter, the column of quicksilver which it sustains is shorter also, and that nearly at the rate of 100 feet for  $\frac{1}{2}$  of an inch of quicksilver. And on these principles depend the structure and use of the barometer.

From the same principle it likewise follows that air, like other fluids, presses equally in all directions. And hence it happens that soft bodies endure this pressure without change of figure, and hard or brittle bodies without breaking, being equally pressed on all parts; but if the pressure be taken off, or diminished, on one side, the effect of it is immediately perceived on the other. See *ATMOSPHERE*, for the total quantity of effects and pressure, and the laws of different altitudes, &c.

From the weight and fluidity of the air, jointly considered, many effects and uses of it may easily be deduced. By the combination of these two qualities, it closely invests the earth, with all the bodies upon it, constringing and binding them down with a great force, namely a pressure equal to about 15 pounds upon every square inch. Hence, for example, it prevents the arterial vessels of plants and animals from being too much distended by the impetus of the circulating juices, or by the elastic force of the air so copiously abounding in them. For hence it happens, that on a diminution of the pressure of the air, in the operation of cupping, we see the parts of the body grow tumid, which causes an alteration in the circulation of the fluids in the capillary vessels.

**3 Elasticity** Another quality of the air, from whence arise a multitude of effects, is its elasticity, a quality by which it yields to the pressure of any other bodies, by contracting its volume, and dilates and expands itself again on the removal or diminution of the pressure. This quality is the chief distinctive property of air, the other two being common to other fluids also.

Of this property we have innumerable instances. Thus, for example, a blown bladder being squeezed in the hand, we find a sensible resistance from the included air, and upon taking off the pressure, the compressed parts immediately restore themselves to their former round figure. And on this property of elasticity depend the structure and uses of the air-pump.

Every particle of air makes a continual effort to dilate itself, and so it acts forcibly against all the neighbouring particles, which also exert the like force in return, but if their resistance happen to cease, or be weakened, the particle immediately expands to an immense extent. Hence it is that thin glass bubbles, or bladders, filled with air, and placed under the receiver

of an air-pump, do, upon pumping out the air, burst asunder by the force of the air which they contain. So likewise a close flaccid bladder, containing only a small quantity of air, being put under the receiver, swells as the receiver is exhausted, and at length appears quite full. And the same thing happens by carrying the flaccid bladder to the top of a very high mountain.

The same experiment shews that this elastic property of the air is very different from the elasticity of solid bodies, and that these are dilated after a different manner from the air. For when air ceases to be compressed, it not only dilates, but then occupies a far greater space, and exists under a volume immensely greater than before, whereas solid elastic bodies only resume the figure they had before they were compressed.

It is plain that the weight or pressure of the air does not at all depend on its elasticity, and that it is neither more nor less heavy than if it were not at all elastic. But from its being elastic, it follows that it is susceptible of a pressure, which reduces it to such a space, that the force of its elasticity, which re-acts against the pressing weight, is exactly equal to that weight. Now the law of the elasticity is such, that it increases in proportion to the density of the air, and that its density increases in proportion to the forces or weights which compress it. But there is a necessary equality between action and re-action, that is, the gravity of the air, which effect its compression, and the elasticity of it, which gives its tendency to expansion, are equal.

So that, the elasticity increasing or diminishing, in the same proportion as the density increases or diminishes, that is, as the distance between its particles decrease or increase, it is no matter whether the air be compressed, and retained in any space, by the weight of the atmosphere, or by any other cause, as in either case it must endeavour to expand with the same force. And therefore, if such air as is near the earth be inclosed in a vessel, so as to have no communication with the external air, the pressure of such inclosed air will be exactly equal to that of the whole external atmosphere. And accordingly we find that quicksilver is sustained to the same height, by the elastic force of air inclosed in a glass vessel, as by the whole pressure of the atmosphere. And on this principle of the condensation and elasticity of the air depend the structure and use of the air-pump.

That the density of the air is always directly proportional to the force or weight which compresses it, was proved by Boyle and Mariotte, at least as far as their experiments go on this head. And Mr Mariotte has shewn that the same rule takes place in condensed air. However, this rule is not to be admitted as scrupulously exact, for when air is very forcibly compressed, so as to be reduced to  $\frac{1}{10}$  of its ordinary bulk, the effect does not answer precisely to the rule, for in this case the air begins to make a greater resistance, and requires

stronger compression, than according to the rule. And hence it would seem, that the particles of air cannot, by means of any possible weight or pressure, how great soever, be brought into perfect contact, or that it cannot thus be reduced to a solid mass, and consequently that there must be a limit to which this condensation of the air can never arrive. And the same remark is true with regard to the rarefaction of air, namely, that in very high degrees of rarefaction, the elasticity is decreased rather more than in proportion to the weight or density of the air, and hence there must also be a limit to the rarefaction and expansion of the air, by which it is prevented from expanding to infinity.

The elasticity of the air exerts its force equally in all directions, and when it is at liberty, and freed from the cause which compressed it, it expands equally in all directions, and in consequence always assumes a spherical figure in the interstices of the fluids in which it is lodged. This is evident in liquors placed in the receiver of an air-pump, by exhausting the air at first there appears a multitude of exceeding small bubbles, like grains of fine sand, dispersed through the fluid mass, and rising upwards, and as more air is pumped out, they enlarge in size, but still they continue round. Also if a plate of metal be immersed in the liquor, on pumping, its surface will be seen covered over with small round bubbles, composed of the air which adhered to it, now expanding itself. And for the same reason it is that large glass globes are always blown up of a spherical shape, by blowing air through an iron tube into a piece of melted glass at the end of the pipe.

The expansion of the air, by virtue of its elastic property, when only the compressing force is taken off, or diminished, is found to be surprisingly great, and yet we are far from knowing the utmost dilatation of which it is capable. In several experiments made by Mr Boyle, it expanded first into 9 times its former space, then into 31 times, then into 60, and then into 150 times. Afterwards, it was brought to dilate into 8000 times its first space; then into 10000, and at last even into 13679 times its space, and this solely by its own natural expansive force, by only removing the pressure, but without the help of fire. And on this principle depend the construction and use of the MANOMETER.

The elasticity of the air, under one and the same pressure, is still farther increased by heat, and diminished by cold, and that, by some of the most accurate experiments made by Sir George Shuckburgh, at the rate of the 440th part of its volume nearly, for each degree of the variation of heat, from that of temperate, in Fahrenheit's thermometer.

This property explains the common effect observed on bringing a close flaccid bladder near the fire to warm it; when it is presently found so swell as if more air were blown into it. And upon this principle depend the structure and office of the thermometer, as also in air-balloons.

The elastic power of the air becomes the second great source of the remarkable effects of this important fluid. By this property it insinuates itself into the pores of bodies, where, by means of this virtue of expanding, which is so easily excited, it must put the particles of those bodies into perpetual vibrations, and maintain a continual motion of dilatation and contraction in all bodies, by the incessant changes in its gravity and density, and consequently its elasticity and expansion.

This reciprocation is observable in several instances, particularly in plants, in which the tracheæ or air-vessels perform the office of lungs, for as the heat increases or diminishes, the air alternately dilates and contracts, and so by turns compresses the vessels, and eases them again, thus promoting a circulation of their juices. And hence it is found that no vegetation or germination is carried on in vacuo.

It is from the same cause, too, that ice is burst by the continual action of the air contained in its bubbles. Thus, too, glasses and other vessels are frequently cracked, when their contained liquors are frozen, and thus also large blocks of stone, and entire columns of marble, sometimes split in the winter season, from some little bubble of included air requiring an increased elasticity, and for the same reason it is that so few stones will bear to be heated by a fire, without cracking into many pieces by the increased expansive force of some air confined within their pores.

From the circumstance that the space occupied by a determinate quantity of air is in the inverse ratio of the elastic force, it follows, that, with the same given temperature, the elasticity of two molecules of air does not augment by their mutual approach.

To render this conclusion sensible, conceive a mass of air included in a bladder which communicates with a recurved or syphon-like tube containing mercury, and suppose that its elastic force is in equilibrio with a column of mercury of 30 inches in height, if the bladder be compressed in such manner that the air shall be reduced to half its volume, the stratum of air contiguous to the surface of the liquid mercury will evidently have a density twice as great as it had before the compression, and consequently a double number of molecules of air will touch and act upon that surface, therefore, since according to the experiment, the height of the column of mercury has been doubled, the elasticity of each molecule has necessarily been the same. Hence it follows, as we have stated, that with a given temperature, the elasticity of the molecule of air is not increased by their mutual approach, it merely multiplies the number of molecules acting upon an assumed surface.

The truth thus established manifestly leads to the following results.

1 The molecule of a gas yield sensibly only to the repulsive force of caloric, and the attraction which they exercise one upon another is very small with respect to that force: thus their elasticity depends exclusively upon the



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temperature, and the quantity of free caloric which exists in a mass of air is, at equal temperatures, proportional to its volume; for, if there were more under the same volumes in the state of condensation than in that of dilatation, the repulsive force of two neighbouring molecules would be augmented.

2 If the volume of a gas be diminished a third or a half, there must be disengaged a third or a half of the free caloric which existed between its molecules. The effect of the caloric thus disengaged is perceptible upon the velocity of sound, it produces the excess of that velocity over that given by the ordinary theory, as has been shown by the calculus of Laplace and others.

3 If we conceive equal volumes of two different gases comprised in two envelopes of the same capacity, and inextensible, and suppose that, at a given temperature, the elasticity of these two gases is the same; on augmenting in the same manner their temperature, the augmentation of their elasticity will be the same, since it depends only upon their temperature. If we now conceive the envelopes, comprising the two gases to become extensible, these gases will dilate until their elasticity is in equilibrium with the pressure of the atmosphere surrounding the envelopes, and since for each gas the volume is in the inverse ratio of the elastic force, the two gases will assume the same volume and will dilate equally, which is conformable to experience.

### II Chemical Properties of Atmospheric Air

1 *The Dissolving Faculty of Air* Air and water exert upon one another a reciprocal, but unequal, attraction, in virtue of which the water dissolves the air, and the air the water, but in a greater proportion, for if well dried air be left upon water duly purged, both of them will satisfy their reciprocal attraction, and two saturations will be established: a cubic foot of air will give ten or twelve grains of water. Chemistry furnishes many examples of bodies which thus divide themselves in the ratio of their attractions.

It is the property of any dissolvent whatever to impart to the substance dissolved its form and density, whence it results that the water by being dissolved in the air has lost its liquidity and acquired aeriform fluidity; and that the air on being dissolved in water loses its aeriform state and requires that of liquidity. The air contained in water is not therefore in the elastic state, it has assumed the form and very nearly the density of water, and consequently it will not affect its transparency.

The solution of water in air constitutes vaporization, which must be carefully distinguished from vaporization, the latter consisting in the solution of water through the operation of caloric. See EVAPORATION and VAPORIZATION.

The dissolving faculty of the air is in the ratio of its temperature and of the pressure which it experiences, and, as the temperature and pressure of the atmosphere suffer great and frequent variations, it results that the air be-

comes sometimes more, sometimes less, greedy of water, so that it raises it, or precipitates it, according to circumstances: hence come rain, dews, snow, and in general all the aqueous meteors of which the atmosphere is the theatre. See RAIN, DEW, &c.

1 *Composition, &c of Air* During many ages the air we breathe was considered as a simple homogeneous fluid: various exhalations, indeed, and particles of bodies continually arising from the earth, were observed to be mixed with it, and upon these were supposed to depend its different degrees of salubrity, but the aeriform fluid itself was never, till the latter end of the eighteenth century, known to be a compound substance. This point, however, has been clearly ascertained by the discoveries of modern chemists, particularly those of Dr Priestley, Black, Cavendish, Lavoisier, Berzelius, &c. From the united testimony of these discoveries, we are authorized to conclude that atmospheric air is composed of at least two species of air or elastic fluid, which are called vital air or oxygen gas, and azotic gas. The first of these is the great agent in respiration and combustion, and upon the proper proportion of it depends the purity of the atmosphere: the latter possesses contrary qualities, is noxious to animals, and incapable of maintaining combustion: the proportion of these in 100 parts of atmospheric air, is commonly about 20 or 27 parts of vital air, and 74 or 73 parts of azotic gas by weight, or about 22 parts of the former, and 78 of the latter, by bulk.

The component principles of atmospheric air may be ascertained by the following experiment. If heat be applied to mercury enclosed in a proper vessel of this air, the air will be diminished, and the mercury will lose its splendour, gradually changing to a reddish powder, and acquiring an addition to its weight. When no further change is observed, the separation of the principles of air has taken place. That portion of the air which remains in the receiver is unfit for supporting flame, or maintaining respiration, and is azotic gas, the other part, which is oxygen gas, is absorbed by the mercury, which it reduces to the state of an oxide, and from which it may afterwards be extracted by heat. By this last operation the mercury will be restored to its metallic state, and will lose the weight it had acquired during its oxidation.

These separated gases, thus differing in their properties from each other, and from atmospheric air, being again mixed in the proportion above stated, form atmospheric air of the ordinary degree of purity, differing from it, however, in some trifling respects, which do not invalidate the general conclusion, but which are probably occasioned by our inability to combine the ingredients so perfectly as they are combined by nature. The air of the atmosphere, however, is not so simple as to be formed of only two species of elastic fluid: for, beside the numerous particles of water and other substances it contains (for an account of which see AIR-



OSPHERE), a small quantity of carbonic acid gas or fixed air is found in it, in the proportion of about one hundredth part, and a still smaller quantity of hydrogen gas.

Indeed the determination of the nature and proportion of the constituent parts of the atmosphere here is a delicate problem, respecting which it is reasonable to expect some slight difference in the results. Mr Dalton, who has made many interesting researches on this topic, gives the following results.

*Table of the weights of the different gases constituting the atmosphere.*

	<i>Inches of mercury</i>
Azotic gas	23 30
Oxygenous gas	6 18
Aqueous vapour	44
Carbonic acid gas	02
	<hr/> 30 00

*Table of the proportional weights of the different gases in a volume of atmospheric air, taken at the surface of the earth.*

	<i>per cent</i>
Azotic gas	78 10
Oxygenous gas	23 2
Aqueous vapour	1 03 variable
Carbonic acid gas	10
	<hr/> 100 00

Mr Cavendish is the first who endeavoured to establish that the proportions of the two principal elements of the atmospheric air were constant, notwithstanding the distance of places and the difference of temperature. The observations since made by M. de Lavoisier in Spain, M. Berthollet in Egypt and in France, Mr Davy in England, and Dr Beddoe on the air brought from the coast of Guinea, seem to have confirmed this grand result. But one of the finest experiments is that of Gay Lussac (mentioned article AEROSTATION) who brought down air from the height of 6900 metres and this air being analysed on his return, gave the constituent principles in the same proportions, a proof that the chemical constitution of the atmosphere is the same at those great latitudes as at the surface of the earth. This result has been farther confirmed by the experiments of Humboldt and Gay-Lussac on Eudiometry: the air of the surface of the earth, analysed at different days, at various hours and temperatures, presented no change in its composition. It always contained 0.21 of oxygen in volume, 0.783 of azote, 0.003 of hydrogen, and 0.004 of carbonic acid gas.

Mr Dalton considers the general atmosphere as composed of four fluids principally, or four particular atmospheres, namely, those of the four gases mentioned above. These he supposes to be totally unconnected with each other, the particles of the one not acting on the particles of the other. agreeably to his opinion that in a mixture of two or more different elastic fluids, the particles of the one fluid nei-

ther attract nor repel those of the others, differing in this from the articles of homogeneous elastic fluids, which repel each other with a force reciprocally proportional to the distance of their centres from each other. Applying this principle to the atmospheric air, he supposes that the density and elastic force of each gas, at the earth's surface, are the effects of the weight of the atmosphere of that gas solely, the different atmospheres not gravitating one upon another.

But many objections drawn both from the principles of chemistry, and those of hydrostatics, have been urged against this hypothesis, especially by Berthollet, Hwuy, Gough, and Thomson: to whose writings the reader may be referred for satisfaction, as to this particular.

The most distinguishing chemical properties of atmospheric air, are the support it admits to combustion, and to the respiration of animals, both which depend upon the presence of oxygen. It has been long known that combustion can never take place without the help of air, and that it is always in proportion to the purity and the quantity of that fluid. Ever since the time of Boyle, who discovered these facts, philosophers have been much occupied in considering them, and various hypotheses have been offered to explain them. Boerhaave thought that air contributed to combustion by operating on the surfaces of combustible bodies, so as to dissect them, if the expression may be allowed, into their component particles, others supposed that air was necessary to confine the flame about the body, and not suffer it to be dissipated before combustion was effected. But neither of these will explain why combustion renders air unfit for that purpose a second time, or why the same air could not equally promote it at all times. Indeed every thing on this subject was mere conjecture before the discovery of vital air by Priestley, and the elaborate researches of Lavoisier, which together have very clearly shown us that, in every instance of combustion which takes place in atmospheric air, the air itself is decomposed its vital part, i. e. of oxygen gas, is absorbed by the combustible body, and the azotic gas is set at liberty, that combustion is less rapid and intense in atmospheric air, than in oxygen gas alone, and that no combustion can possibly take place where this gas is not present. These principles will be more amply detailed and illustrated in the article COMBUSTION.

In respiration also, the air is decomposed. Being inhaled by the lungs, its oxygen combines with the carbon disengaged by the blood, and thus forms carbonic acid, which, together with azotic gas, is exhaled. Respiration is in fact but a slower combustion, in which part of the heat of vital air enters the blood as it passes through the lungs, and is by it conveyed through the whole body, and thus animal bodies are supplied with heat, to compensate for that which they are constantly giving out to the atmosphere and other surrounding bodies. A more particular account of the different prob-

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cesses of respiration will be given under that word these hints are sufficient for our present purpose

Atmospheric air is also very useful in chemical experiments, many of which could not be performed without it, as its presence is necessary either for preserving a proper temperature, or for supplying one or other of the gaseous substances which it holds in combination

From the whole, then, it is evident that, as the action of combustion and respiration is constant and universal the air which encompasses our globe is suffering continual alterations, and the great consumption of oxygen by these and other different processes, might lead us to fear a deficiency of this essential fluid in the atmosphere, if the wisdom of Providence, which is every where manifest, had not furnished means for restoring the purity of the air, which upon the whole are equal in effect to those which destroy it Among the most important of these are the leaves of vegetables, which exist so plentifully throughout nature, and which have the singular property of imbibing oxygen from the moisture which promotes their growth and from the air by night and in the day-time pouring into the atmosphere increased quantities of this enlivening fluid This purifying quality of vegetables was discovered by Dr Priestley Another mode by which the vitiated state of the atmosphere is corrected, is the exhalation of the sea, and other large bodies of water which thus carry off many noxious particles

When the air is vitiated by putrefaction, and other similar processes its putridity may be corrected by means of lime, and substances which are putrifying may also be neutralised in a great degree by throwing upon them a mixture of lime, water, and ashes or soap lye For the purpose of destroying the contagion of infected air Dr C Smith employed the fumes of nitric acid, Moreover, muriatic acid gas, and Mr Cruickshank, oxy-muriatic acid gas these are all efficacious, but the last, which is now employed with the greatest success in the British navy and military hospitals, acts with more energy than the others, and is easily procured by the following method Let two parts of muriatic of soda (common salt) be mixed with one part of the black oxide of manganese let the mixture be placed in an open vessel in the infected apartment, and two parts of sulphuric acid poured upon it The fumes of oxy-muriatic acid are immediately exhaled, fill the room and destroy the contagion It has been recommended to artificers who are much employed over a charcoal fire to place near them a flat-bottomed vessel filled with lime-water, which should be renewed every day, or so often as a variegated film or pellicle appears floating on the water

AIR, factitious, or artificial, a name given by Boyle to all those elastic fluids which he found produced in chemical experiments, and to be different from the air of the atmosphere Since his time their number is so much increased, and their properties are so well known, as to

require separate names to distinguish them They are as follow

1 *Acid, or Marine Air* The same is that which is now called MURIATIC ACID GAS, which see

2 *Alkaline Air*, an account of which is given under the term AMMONIACAL GAS

3 *Fixed, Ferule, or Mephitic Air* See CARBONIC ACID GAS

4 *Dephlogisticated, Vital, or Pure Air*, or Scheel's Air of Fire See OXYGEN GAS

5 *Dephlogisticated Marine Air* See OXY-MURIATIC ACID GAS

6 *Dephlogisticated Nitrous Air* See NITROUS OXYD

7 *Fluoric Acid, or Sparry Acid Air* See FLUORIC ACID GAS

8 *Inflammable Air* See HYDROGEN GAS

9 *Heavy Inflammable Air* See CARBON, GASEOUS OXYD OF, OR CARBONATED HYDROGEN GAS

10 *Sulphurated Inflammable, or Hepatic Air* See HYDROGEN GAS, SULPHURATED

11 *Nitrous Air* See NITROUS GAS

12 *Prussic Acid Gas*

13 *Phlogisticated, Nitrogenous, or Mephitic Air* See AZOTIC GAS

14 *Nitrolic Acid Air* See SULPHURIC ACID GAS

To which may be added,

15 *Olefant Gas*

On the subject of air the student may consult with advantage Priestley's Observations, in five volumes octavo Lavoisier's Elements of Chemistry, octavo, Fourcroy's Chemistry, four volumes octavo, and Lavoisier's Essays, Chemical and Physical, vol 1 where a history of the discoveries is given, which are also well related in Dr Gregory's Economy of Nature, vol 1

AIR, in music, signifies the melody, or the infusion of a musical composition According to Dr Busby the strict import of the word is confined to vocal music, though it has generally been extended to that which is sung or played, and forms that chain of sounds which is called a tune Frequently, the principal vocal part is called the air

AIR, in the manage, is that cadence or liberty of motion in a horse, which naturally disposes him to work in the manage, and rise with facility, measure, and justness of time

Many riding masters take the word air in a confined sense, as signifying only a manage that is higher, slower, and of a more complex nature than the terra a terra, while others allow it a more extensive signification, so as to include the terra a terra, in which, if the horse manage well, they say "the rider has hit upon the air of the horse" The walk, trot, and gallop, are in general not accounted airs, and yet there are some very good masters who by the word air signify the motion of a horse's legs upon a gallop For instance, they say, such a horse has not a good or natural air, or in other words he does not bend his fore legs sufficiently—High airs, or high manage, are the

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motions of a horse that rises higher than the terra a terra, and works at curiots, balotades, croupades, and caprioles. It will be necessary, when a horse has the beginning, or first steps of raised airs, and affects a high manage, to encourage this disposition by gentle means, rather than by forcing him to do too much at first, for these high airs are apt to make a horse angry, and very much baulk and dishearten him, when he is too much pressed to them and before you attempt to leap him, care should be taken to have his shoulders well supplied. See PESATE, and LEAPING.

To AIR *v a* (from *n* the noun) 1 To expose or open to the air (*Dryden*) 2 To give enjoyment of the air (*Addison*)

AIR (from *aire*, from *aire*, to take away) Darnel: so named from its being a weed that requires removal

AIR A Hair grass A genus of the class and order trian tria dignum. Its calyx two-valved, two-flowered, corol two-valved, florets without an imperfect one between them. There are seventeen species of this grass, of which some are awn'd, and others awnless. Of the first, five species are found on the heaths, meadows, sandy pastures, or sea coasts of our own country, and of the last, two only are natives of Britain, and grow wild in our pasture-lands.

AIR-BALLOONS, a general name given to bags of any light substance filled with inflammable air, or other permanently elastic fluid, whose specific gravity is considerably less than that of common atmospheric air. See AEROSTATION.

AIR ADDLER, a kind of vesicula found in the bodies of fish, and denominated "the Sound, by means whereof they are enabled to sustain themselves in any depth of water, and either to rise or sink at pleasure. The air-bladder is the same with what is otherwise called the swimming-bladder. It lies close to the back-bone, and has a pretty strong muscular coat whereby it can contract itself. By contracting this bag, and condensing the air within it, fish can make their bodies specifically heavier than water, and so readily fall to the bottom, whereas the muscular fibres ceasing to act, the air is again dilated, and they become specifically lighter than water, and so swim above. According to the different degrees of contraction and dilatation of this bladder, they can keep higher or lower in the water at pleasure. Hence flounders, soles, rays, skate, and such other fishes as want this sac, are found mostly grovelling at the bottom of the water. It is owing to this that dead fishes (unless this membrane has been previously broken) are found swimming on the surface, the muscular fibres then ceasing to act, and with their bellies uppermost, for the back bone cannot yield, and the distended sac is protruded into the abdomen, and the back is consequently heaviest at its upper part according to their posture. There is here placed a glandular substance, containing a good quantity of red blood, and it is very probable that the air con-

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tained in the swimming-bladder is derived from this substance. From the anterior part of the bag go out two processes or appendices, which, according to the gentlemen of the French academy, terminate in their fauces. In a variety of other fishes we find communications with some parts of the alimentary canal, particularly the oesophagus and stomach. The salmon has an opening from the fore end of the air-bag into the oesophagus, which is surrounded by a kind of muscular fibres. The herring has a funnel-like passage leading from the bottom of the stomach into the air-bag, but it is not determined whether the air enters the air-bag by this opening, or comes out by it. The latter, however, seems to be the more probable opinion, as the glandular body is found in all fishes, whereas there are several without this passage of communication.

The ancients were of opinion, that the air-bladder in fishes served for some purposes essentially necessary to life and Dr Priestley conjectured, that the raising or depressing the fish is not the only use of these air-bladders, but that they also may serve some other purposes in the economy of fishes. There are many arguments indeed to be used on this side of the question. The most conclusive of which is, that all the cariliginous kind of fishes want air-bladders, and yet they rise to the top or sink to the bottom of the water without any difficulty, and though most of the eel-kind have air bladders, yet they cannot raise themselves in the water without great difficulty.

AIR-BLADDERS, or AIR-BAGS, in ornithology; are cells or receptacles of air in the bodies of birds, which communicate with the lungs, and which are lodged both among the fleshy parts, and in the hollow bones of these animals. Mr John Hunter informs us, that the air cells which are found in the soft parts of birds, have no communication with the cavity of the common cellular membrane of the body, some of them communicate immediately with one another, and all of them may be said to have a communication together, by means of the lungs: a common centre. Some of them are placed in larger cavities, such as the abdomen, others are so lodged in the interstices of parts, that they would, at first, appear to be the common connecting membrane, as about the breast, axilla, &c. The bones which receive air, are of two kinds: some, as the sternum, ribs, and vertebrae, have their internal substance divided into innumerable cells, whilst others as the os humeri, and the os femoris, are hollowed out into one large canal. The conjectures respecting the use of these cavities are very various, but we cannot give them in detail here. The inquisitive reader may consult Hunter, in Phil Trans vol lxxiv p 205, &c. Dr Latham, in Linnæan Trans vol iv p 94, &c.

AIRBUILT *a* (from *air* and *built*) Built in the air (*Pope*)

AIRDRAWN *a* Painted in air (*Shaks*)

ATPER *s* (from *To air*) He that exposes to the air

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**AIRE**, a shire of Scotland, having its principal town of the same name Aire is 65 miles SW of Edinburgh The county contains 84306 people

**AIRE**, a district of Artois, in the Netherlands, its capital is also of the same name It lies 27 miles W from Lille Lat 50 46 N Long. 2 32 E.

**AIR-GUN**, in pneumatics, is a machine for propelling bullets with great violence, by the sole means of condensed air

The first account we meet with of an air-gun is in the *Elemens d'Artillerie* of David Rivaut, who was preceptor to Louis XIII of France He ascribes the invention to one Marin, a burgher of Lisieux, who presented one to Henry IV

To construct a machine of this kind, it is only necessary to take a strong vessel of any sort, into which the air is to be thrown or condensed by means of a syringe, or otherwise, the more the better, then a valve is suddenly opened, which lets the air escape by a small tube in which a bullet is placed, and which is thus violently forced out before the air

It is evident then, that the effect is produced by virtue of the elastic property of the air, the force of which, as has been shown in a former article, is directly proportional to its condensation, and therefore the greater quantity that can be forced into the engine, the greater will be the effect Now this effect will be exactly similar to that of a gun charged with powder, and therefore we can easily form a comparison between them for inflamed gunpowder is nothing more than very condensed elastic air so that the two forces are exactly similar Now it is shewn by Mr Robins, in his *New Principles of Gunnery*, that the fluid of inflamed gun-powder has, at the first moment, a force of elasticity equal to about a 1000 times that of common air, and therefore it is necessary that air should be condensed a 1000 times more than in its natural state, to produce the same effect as gun-powder But then it is to be considered, that the velocities with which equal balls are impelled, are directly proportional to the square roots of the forces, so that if the air in an air-gun be condensed only 10 times, then the velocity it will project a ball with will be, by that rule,  $\frac{1}{10}$ th of that arising from gun-powder, and if the air were condensed 20 times, it would communicate a velocity of  $\frac{1}{5}$ th of that of gun powder But in reality the air-gun shoots its ball with a much greater proportion of velocity than as above, and for this reason, that as the reservoir, or magazine of condensed air, is commonly very large in proportion to the tube which contains the ball, its density is very little altered by expanding through that narrow tube, and consequently the ball is urged all the way by nearly the same uniform force as at the first instant, whereas the elastic fluid arising from inflamed gun-powder is but very small in proportion to the tube or barrel of the gun, occupying at first, indeed, but a very small portion of it next the but-end, and therefore, by diluting

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into a comparatively large space, as it urges the ball along the barrel, its elastic force is proportionally weakened, and it acts always less and less on the ball in the tube From which cause it happens that air condensed into a good large machine only 10 times, will shoot its ball with a velocity little inferior to that given by the gun powder And if the valve of communication be suddenly shut again by a spring, after opening it to let some air escape, then the same collection of it may serve to impel many balls, one after another The common air-gun is made of brass, and has two barrels, the inside barrel A, (pl 9 fig 1) which is of a small bore, from whence the bullets are exploded, and a large barrel ECDF on the outside of it There is a syringe SMP fixed in the stock of the gun, by which the air is injected into the cavity between the two barrels through the valve EP The ball K is put down into its place in the small barrel, with the rammer, as in any other gun At SL is another valve, which, being opened by the trigger O, permits the air to come behind the bullet, so as to drive it forwards If this valve be opened and shut suddenly, one charge of condensed air may be sufficient for several discharges of bullets, but if the whole air be discharged on one single bullet, it will drive it out with a greater force This discharge is effected by means of a lock placed as in other guns, for the trigger being pulled, the cock will go down and drive the lever O, fig 1 which will open the valve, and let in the air, upon the bullet K

Air-guns of late years have been much improved in their construction Fig 2 represents one made by the late Mr B Martin which, for simplicity and perfection, exceeds all others A is the barrel, with the lock, stock, run-rod, &c of the size and weight of a common fowling-piece Under the lock at l, is a round steel tube, having a small moveable pin in the inside, which is pushed out when the trigger a is pulled, by the spring work within the lock, to this tube b, a hollow copper ball c screws, perfectly air tight This copper ball is fully charged with condensed air by the syringe B (fig 3) previous to its being applied to the tube b of fig 2 It is then evident, that if a bullet be rammed down in the barrel, the copper ball screws fast at b, and the trigger a be pulled, that the pin in b will by the action of the spring-work within the lock, forcibly strike out into the copper ball and thereby pushing in suddenly a valve within the copper ball, let out a portion of the condensed air, which air will rush up through the aperture of the lock and forcibly act against the bullet, driving it to the distance of 60 or 70 yards, or further If the air be strongly condensed, at every discharge only a portion of the air escapes from the ball, therefore, by re-cocking the piece, another discharge may be made, and this repeated to the amount of 16 or 16 times An additional barrel is sometimes made, and applied for the discharge of shot, instead of the one above described

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The air in the copper ball is condensed by means of the syringe B (fig 3), in the following manner. The ball c is screwed quite close on the top of the syringe. At the end of the steel-pointed rod a, is a stout ring, through which passes the rod k upon this rod the feet should be firmly set, then the hands are to be applied to the two handles n, fixed on the side of the barrel of the syringe. Now by moving the barrel B steadily up and down on the rod a, the ball c will become charged with condensed air, and it may be easily known when the ball is as full as possible, by the irresistible action that it makes against the piston when you are working the syringe. At the end of the rod k is usually a four square hole, which with the rod serves as a key to fasten the ball c fast on the screw h of the gun and syringe close to the orifice in the ball c. In the inside is fixed a valve and spring, which gives way for the admission of air, but upon its emission comes close up to the orifice, shutting up the internal air. The piston-rod works air tight, by a collar of leather on it, in the barrel B, it is therefore plain when the barrel is drawn up, the air will rush in at the hole k. When the barrel is pushed down, the air therein contained will have no other way to pass from the pressure of the piston but into the ball c at top, the barrel being drawn up, the operation is repeated, until the condensation is so strong as to resist the action of the piston.

Sometimes the syringe is applied to the end of the barrel C (see fig 4), the lock and trigger shut up in a brass case d, and the trigger pulled, or discharge made, by pulling the chain f. In this contrivance there is a round chamber for the condensed air at the end of the syringe at e, and it has a valve acting in a similar manner to that of the copper ball. When this instrument is not in use, the brass case d is made to slide off and the instrument then becomes a walking stick, from which circumstance and the barrel being made of cane, brass &c it has received the appellation of the Air-cane. The head of the cane unscrews and takes off at a where the extremity of the piston-rod in the barrel is shown an iron rod is placed in a ring at the end of this, and the air condensed in the barrel in a similar manner to that of the gun as above, but its force of action is not near so strong and permanent as that of the latter.

The Magazine Air-gun was invented upon the same principle as the foregoing, by that ingenious artist L. Colbe. By this contrivance ten bullets are so lodged in a cavity, near the place of discharge, that they may be drawn into the shooting-barrel, and successively discharged so fast as to be nearly of the same use as many different guns. See Desaguliers Phil vol ii p 390.

**AIR-HOLE** a hole to admit the air.

**AIR-JACKET** a sort of jacket made of leather, in which are several bags of bladders, composed of the same materials, and communicating with each other. By the help of these

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bladders, which are placed near the breast, the wearer is supported in any water, without making an effort to swim.

**AIRI, AIRIMA, or AIRIHOZA**, (Indian,) the cassada, a poisonous Indian root.

**AIRINESS** s (from *airy*) 1 Exposure to the air, openness. 2 Lightness, gaiety, levity (*Keiton*).

**AIRING** s (from *air*) A short journey to take the air (*Addison*).

**AIRING OF HORSES**, a part of the manage highly advantageous to them in several respects, first, if the air be pure, it purifies the blood, and purges the body from many gross humours, and so inures the creature to exercise and fatigue, that he is seldom hurt by either, when properly taken care of. Secondly, it teaches him to let his wind rate equally, or keep time with the other motions of his body. Thirdly, it excites in appetite, without which neither gallopers nor hunters will be able to perform their respective offices, with ease to themselves, or satisfaction to their owners.

The best time for airing such horses as are too fat is said by some to be before sun rising and after its setting, while others are of a contrary opinion, and assert that the coldness of the air at these times is too great for the animal to be exposed to, particularly if he be subject to rheums, catarrhs, or other similar complaints, which dew and cold fogs are well known to increase. Let him not be brought out till the sun has risen, when the air will be more mild and temperate, and the exercise rather invigorate than hurt his spirits, and have a greater tendency to increase his bodily strength than to impair or reduce it.

Nor will it be found a very difficult matter by these means alone to bring down a horse's fat, that is too high in flesh, and reduce him to a clear, healthy, moderate state of body, for it is but making his airings longer, and his exercise a little more severe, which will soon reduce him to a perfect wind and true courage. See EXERCISE.

**AIRLESS** a (from *air*) Wanting communication with the free air (*Shakspeare*).

**AIRLING** s (from *air*) A young, light, gay person (*Ben Johnson*).

**AIR-PIPES**, an invention for drawing foul air out of ships, or any other cold places, by means of fire. These pipes were first discovered by a Mr Sutton, a brewer in London, and from him have got the name of Sutton's Air pipes. The principle on which their operation depends is no other than that air is necessary for the support of fire, and, if it have not access from the places most adjacent, will not fail to come from those that are more remote. Thus, in a common furnace, the air enters through the ash-hole, but if this be closed up, and a hole made in the side of a furnace, the air will rush in with great violence through that hole. If a tube of any length whatever be inserted in this hole the air will rush through the tube into the fire, and of consequence there will be a continued circulation.

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tion of air in that place where the extremity of the tube is laid. Mr. Sutton's contrivance then amounts to this. As, in every ship of any bulk, there is already provided a copper or boiling-place proportionable to the size of the vessel, it is proposed to clear the bad air by means of the fire already used under the coppers or boiling-places for the necessary uses of the ship. It is well known, that, under every such copper or boiler, there are placed two holes, separated by a grate, the first of which is for the fire, and the other for the ashes falling from it, and that there is also a flue from the fire-place upward, by which the smoke of the fire is discharged in some convenient place of the ship. It is also well known, that the fire once lighted in these fire-places is only preserved by the constant draught of air through these two holes and flue, and that if the holes are closely stopped up, the fire, though burning ever so briskly before, is immediately put out. But if, after shutting up these holes, another hole is opened, communicating with any other room or any place, and with the fire, it is clear the fire must burn as before, there being a like draught of air through it as there was before the stopping up of the first holes. It is therefore proposed that, in order to clear the holds of ships of the bad air contained in them, the two holes above-mentioned the fire place and a third place, be both closed up with substantial and tight iron doors and a copper or leaden pipe, of sufficient size, be laid from the hold into the ash-place, for the draught of air to come in that way to feed the fire. And thus it seems plain, from what has been already said, that there will be, from the hold, a constant discharge of the air, and consequently that air, so discharged, must be as constantly supplied by fresh air down the hatchways or such other communications as are opened into the hold. And if into this principal pipe so laid into the hold other pipes are let in, communicating respectively either with the well or lower decks, it must follow, that part of the air consumed in feeding the fire must be respectively drawn out of all such places to which the communication shall be so made.

**AIR-PUMP**, a machine, by means whereof the air may be exhausted out of proper vessels. The use and effect of the air pump is, to make, what we popularly call, a vacuum, but this, in reality, is only a degree of rarefaction sufficient to suspend the ordinary effects of the atmosphere. By this machine, therefore, we learn, in some measure, what our earth would be without an atmosphere, and how much all vital, generative, nutritive, and alterative power depend upon it.

The principle on which the air-pump is constructed, is the elasticity of the air, is that on which the common, or water pump is founded, is the gravity of the same air. The structure of the air-pump is, in itself, more simple even than that of the water pump. The latter supposes two principles, gravity and elasticity likewise, so that the water-pump

must first be an air-pump, i. e. it must rarely be the air before it can raise the water. — In effect, water, being a dormant unelastic fluid, needs some external agent to make it ascend, whereas air ascends in virtue of its own elastic activity, its natural tendency is, to separate, and leave a vacuum, and all that remains for art, is to prevent the ambient air from supplying the place of that which thus spontaneously flies away. The invention of this noble instrument, to which the present age is indebted for so many fine discoveries, is ascribed to Otto de Guericke, the celebrated consul of Magdeburg, who exhibited his first public experiments therewith before the emperor and the states of Germany, at the breaking up of the imperial diet at Ratisbon, in the year 1654.

Guericke, indifferent about the solitary possession of an invention which gave entertainment to numbers who came to see his wonderful experiments, gave a minute description of all his pneumatic apparatus to Gaspar Schottus, professor of mathematics at Wirtemberg, who published it with the author's consent with an account of some of its performances, first in 1657 in his *Mechanica Hydraulico-pneumatica*, and then in his *Technica Curiosa*, in 1664, a curious collection of all the wonderful performances of art which he collected by a correspondence over all Europe.

Otto Guericke's air-pump consists of a glass receiver A (fig. 2 pl. 10) of a form nearly spherical, fitted up with a brass cup and cock B. The nozzle of the cup was fixed to a syringe (D) also of brass, bent at D into half a right angle. This had a valve at D, opening from the receiver into the syringe, and shutting when pressed in the opposite direction. In the upper side of the syringe there is another valve E, opening from the syringe into the external air and shutting when pressed inward. The piston had no valve. The syringe, the cock B, and the joint of the tube, were immersed in a cistern filled with water. From this description it is easy to understand the operation of the instrument. When the piston was drawn up from the bottom of the syringe the valve F was kept shut, by the pressure of the external air, and the valve D opened by the elasticity of the air in the receiver. When it was pushed down again, the valve D immediately shut by the superior elasticity of the air in the syringe, and when this was sufficiently compressed, it opened the valve F, and was discharged. It was immersed in water, that no air might find its way through the joints or cocks.

It would seem that this machine was not very perfect, for Guericke says that it took several hours to produce an evacuation of a moderate sized vessel, but he says, that when it was in good order, the rarefaction (for he acknowledges that it was not, nor could be, a complete evacuation) was so great, that when the cock was opened, and water admitted, it filled the receiver so as sometimes to leave no more than the bulk of a pea filled with air.

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This is a little surprising, for, if the valve F be placed as far from the bottom of the syringe as in Schottus's figure, it would appear that the rarefaction could not be greater than what must arise from the air in DF expanding till it filled the whole syringe because, as soon as the piston in its descent passes F it can discharge no more air, but must compress it between F and the bottom, to be expanded again when the piston is drawn up. It is probable that the piston was not very tight, but that on pressing it down it allowed the air to pass it, and the water in which the whole was immersed prevented the return of the air when it was drawn up again, and this accounts for the great time necessary for producing the desired rarefaction.

Guericke, being a gentleman of fortune, spared no expense, and added a part to the machine, which saved his numerous visitants the trouble of hours attendance before they could see the curious experiments with the rarefied air. He made a large copper vessel G (fig. 3), having a pipe and cock below, which passed through the floor of the chamber into an under apartment, where it was joined to the syringe immersed in the cistern of water, and worked by a lever. The upper part of the vessel terminated in a pipe, furnished with a stop-cock H, surrounded with a small brim to hold water for preventing the ingress of air. On the top was another cap I, also filled with water, to protect the junction of the pipes with the receiver K. This great vessel was always kept exhausted, and workmen attended below. When experiments were to be performed in the receiver K, it was set on the top of the great vessel, and the cock H was opened. The air in K immediately diffused itself equally between the two vessels, and was so much more rarefied as the receiver K was smaller than the vessel G. When this rarefaction was not sufficient, the attendants below immediately worked the pump.

These particulars deserve to be recorded, as they show the inventive genius of this celebrated philosopher, and because they are useful even in the present advanced state of the study. Guericke's method of excluding air from all the joints of his apparatus, by immersing these joints in water, is the only method that has to this day been found effectual, and there frequently occur experiments where this exclusion for a long time is absolutely necessary. In such cases it is necessary to construct little cups or cisterns at every joint, and to fill them with water or oil. In a letter to Schottus, 1662-3, he describes very ingenious contrivances for producing complete rarefaction, after the elasticity of the remaining air has been so far diminished that it is not able to open the valves. He opens the exhausting valves by a plug, which is pushed in by the hand, and the discharging valve is opened by a small pump placed on its outside, so that it opens into a void instead of opening against the pressure of the atmosphere. (See Schottus Technica Curiosa, p. 68-70.) These contrivances have

been lately added to air-pumps by Hama and Hunter as new inventions.

Guericke's object was not solely to procure a vessel void of air, but to exhaust the air which was already in it: and his principle was the power which he suspected to be in air of expanding itself into a greater space when the force was removed which he supposed to compress it. He expressly says (Tract de Experimentis Magdeburgicis, et in Epist. ad Schottum,) that the contrivance occurred to him accidentally when occupied with experiments on the Torricellian tube, in which he found that the air would really expand, and completely fill a much larger space than what it usually occupied, and that he had found no limits to the expansion, evincing this by facts which we shall perfectly understand by and by. This was a doctrine quite new, and required a philosophical mind to view it in a general and systematic manner, and it must be owned that his manner of treating the subject is equally remarkable for ingenuity and for modesty. (Epist. ad Schottum.)

His doctrine and his machine were soon spread over Europe. It was the age of literary ardour and philosophical curiosity, and it is most pleasant to us, who, standing on the shoulders of our predecessors, can see far around us, to observe the eagerness with which every new, and to us frivolous, experiment was repeated and canvassed. The worshippers of Aristotle were daily receiving severe mortifications from the experimenters, or empirics as they affected to call them, and they exerted themselves strenuously in support of his now tottering cause. This contributed to the rapid propagation of every discovery, and it was a most profitable and respectable business to go through the chief cities of Germany and France exhibiting philosophical experiments.

About this time the foundations of the Royal Society of London were laid. Mr Boyle, Mr Wren, lord Brouncker, Dr Wallis, and other curious gentlemen, held meetings at Oxford, in which were received accounts of whatever was doing in the study of nature, and many experiments were exhibited. The researches of Galileo, Torricelli, and Pascal, concerning the pressure of the air, greatly engaged their attention, and many additions were made to their discoveries. Mr Boyle, the most ardent and successful student of nature, had the principal share in these improvements, his inquisitive mind being aided by an opulent fortune. In a letter to his nephew lord Duncarvon, he says that he had made many attempts to see the appearances exhibited by bodies freed from the pressure of the air. He had made Torricellian tubes, having a small vessel a-top, into which he put some bodies before filling the tubes with mercury, so that when the tube was set upright, and the mercury run out, the bodies were in vacuo. He had also abstracted the water from a vessel, by a small pump, by means of its weight, having previously put bodies into the vessel along with the water. But all these ways were very trou-



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ble and imperfect. He was delighted when he learned from Schottus's first publication, that counsellor Guericke had effected this by the expansive power of the air, and immediately set about constructing a machine from his own ideas, no description of Guericke's being then published.

It consisted of a receiver A fig 6 (pl 8), furnished with a stop-cock B, and syringe CD placed in a vertical position below the receiver. Its valve C was in its bottom, close adjoining to the entry of the pipe of communication, and the hole by which the air issued was further secured by a plug, which could be removed. The piston was moved by a wheel and rack-work. The receiver of Guericke's pump was but ill adapted for any considerable variety of experiments, and accordingly very few were made in it. Mr Boyle's receiver had a large opening EF, with a strong glass margin. To this was fitted a strong brass cap, pierced with a hole G in its middle, to which was fitted a plug ground into it, and shaped like the key of a cock. The extremity of this key was furnished with a screw, to which could be affixed a hook, or a variety of pieces for supporting what was to be examined in the receiver, or for producing various motions within it, without admitting the air. This was further guarded against by means of oil poured round the key, where it was retained by the hollow cup-like form of the cover. With all these precautions, however, Mr Boyle ingenuously confesses, that it was but seldom, and with great difficulty, that he could produce an extreme degree of rarefaction, and it appears by Guericke's letter to Schottus, that in this respect the Magdeburgh machine had the advantage. But most of Boyle's very interesting experiments did not require this extreme rarefaction, and the variety of them, and their philosophic importance, compensated for this defect, and soon eclipsed the fame of the inventor to such a degree, that the state of air in the receiver was generally denominated the vacuum Boyleanum, and the air-pump was called *machina Boyleana*. It does not appear that Guericke was at all solicitous to maintain his claim to priority of invention. He seems to have been of a truly noble and philosophical mind, aiming at nothing but the advancement of science.

Mr Boyle found, that to make a vessel air-tight it was sufficient to place a piece of wet or oiled leather on its brim, and to lay a flat plate of metal upon this. The pressure of the external air squeezed the two solid bodies so hard together, that the soft leather effectually excluded it. This enabled him to render the whole machine incomparably more convenient for a variety of experiments. He caused the conduit-pipe to terminate in a flat plate which he covered with leather, and on this he set the glass ball or receiver, which had both its upper and lower brim ground flat. He covered the upper orifice in like manner with a piece of oiled leather and a flat plate, having cocks and a variety of other performances and contrivances suited to his purposes. This he found infinite-

ly more expeditious, and also tighter, than the clannny cements which he had formerly used for securing the joints.

He was now assisted by Dr Hooke, probably the most ingenious and inventive mechanic that the world has ever seen. This person made a great improvement on the air-pump, by applying two syringes whose piston rods were worked by the same wheel, and putting valves in the pistons in the same manner as in the piston of a common pump. This evidently doubled the expedition of the pump's operation, and greatly diminished the labour of pumping.

This is therefore the form of the air-pump which is most generally used all over Europe. Some traces of national prepossession remain. In Germany, air pumps are frequently made after the original model of Guericke's (*Wolff's Cyclomathesis*), and the French generally use the pump made by Papin, though extremely awkward. We shall give a description of Boyle's air-pump as finally improved by Hawkesbee, which, with some small accommodations to particular views, still remains the most approved form.

Here follows the description from Desaguliers.

It consists of two brass barrels *a a*, *a a* (pl 8 fig 5), 12 inches high and 2 wide. The pistons are raised and depressed by turning the winch *b b*. This is fastened to an axis passing through a strong toothed wheel, which lays hold of the teeth of the racks *c c c c*. Then the one is raised while the other is depressed, by which means the valves, which are made of limber bladder, fixed in the upper part of each piston, as well as in the openings into the bottom of the barrels, perform their office of discharging the air from the barrels, and admitting into them the air from the receiver to be afterwards discharged, and when the receiver comes to be pretty well exhausted of its air, the pressure of the atmosphere in the descending piston is nearly so great, that the power required to raise the other is little more than is necessary for overcoming the friction of the piston, which renders this pump preferable to all others, which require more force to work them as the rarefaction of the air in the receiver advances.

The barrels are set in a brass dish about two inches deep, filled with water or oil to prevent the insinuation of air. The barrels are screwed tight down by the nuts *e e*, *e e*, which force the frontispiece *f f* down on them, through which the two pillars *g g*, *g g* pass.

From between the barrels rises a slender brass pipe *h h*, communicating with each by a perforation in the transverse piece of brass on which they stand. The upper end of this pipe communicates with another perforated piece of brass, which screws underneath the plate *i i i*, of ten inches diameter, and surrounded with a brass rim to prevent the shedding of water used in some experiments. This piece of brass has three branches. 1st, A horizontal



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one communicating with the conduit pipe *h h* 2 An upright one screwed into the middle of the pump-plate, and terminating in a small pipe *k*, rising about an inch above it 3d, Is a perpendicular one, looking downwards in the continuation of the pipe *k*, and having a hollow screw in its end receiving the brass cap of the gage pipe *l l l l*, which is of glass, 34 inches long, and immersed in a glass cistern ~~as~~ *as* filled with mercury This is covered a-top with a cork float, carrying the weight of a light wooden scale divided into inches, which are numbered from the surface of the mercury in the cistern This scale will therefore rise and fall with the mercury in the cistern, and indicate the true elevation of it in the tube

There is a stop-cock immediately above the insertion of the gage pipe, by which its communication may be cut off There is another at *n*, by which a communication is opened with the external air for allowing its readmission, and there is sometimes another immediately within the insertion of the conduit-pipe for cutting off the communication between the receiver and the pump This is particularly useful when the rarefaction is to be continued long, as there are by these means fewer chances of the insinuation of air by the many joints

The receiver are made tight by simply setting them on the pump plate with a piece of wet or oiled leather between, and the receivers, which are open a-top, have a brass cover set on them in the same manner In these covers there are various perforations and contrivances for various purposes The one in the figure has a slip wire passing through a collar of oiled leather, having a hook or a screw in its lower end for hanging any thing on, or producing a variety of motions

Sometimes the receivers are set on another plate, which has a pipe screwed into its middle, furnished with a stop cock and a screw, which fits the middle pipe *k* When the rarefaction has been made in it, the cock is shut, and then the whole may be unscrewed from the pump, and removed to any convenient place This is called a transporter plate

It only remains to explain the gage *l l l l* In the ordinary state of the air its elasticity balances the pressure of the incumbent atmosphere We find this from the force that is necessary to squeeze it into less bulk in opposition to this elasticity Therefore the elasticity of the air increases with the vicinity of its particles It is therefore reasonable to expect, that when we allow it to occupy more room, and its particles are further asunder, its elasticity will be diminished, though not annihilated, that is, it will no longer balance the whole pressure of the atmosphere, though it may still balance part of it If therefore an upright pipe have its lower end immersed in a vessel of mercury, and communicate by its upper end with a vessel containing rarefied, therefore less elastic, air, we should expect that the pressure of the air will prevail, and force the mercury into the tube, and cause it to rise to

such a height that the weight of the mercury, joined to the elasticity of the rarefied air acting on its upper surface, shall be exactly equal to the whole pressure of the atmosphere The height of the mercury is the exact measure of that part of the whole pressure which is not balanced by the elasticity of the rarefied air, and its deficiency from the height of the mercury in the Torricellian tube is the exact measure of this remaining elasticity

It is evident, therefore, that the pipe will be a scale of the elasticity of the remaining air, and will indicate in some sort the degree of rarefaction for there must be some analogy between the density of the air and its elasticity, and we have no reason to imagine that they do not increase and diminish together, although we may be ignorant of the law, that is, of the change of elasticity corresponding to a known change of density This is to be discovered by experiment, and the air-pump itself furnishes us with the best experiments for this purpose After trying till the mercury in the gage *h* is attained half the height of that in the Torricellian tube, shut the communication with the barrels and gage, and admit the water into the receiver It will go in till all is again in equilibrium with the pressure of the atmosphere, that is, till the air in the receiver has collapsed into its natural bulk This we can accurately measure and compare with the whole capacity of the receiver, and thus obtain the precise degree of rarefaction corresponding to half the natural elasticity We can do the same thing with the elasticity reduced to one third, one fourth, &c. and thus discover the whole law

Notwithstanding the great excellency of Mr Hawksbee's air pump, it was still subject to inconveniences, from which it was in a great measure relieved by some contrivances of Mr Smeaton, which are described at large in the Philos Trans, for the year 1752 The principal improvements suggested by Mr Smeaton relate to the gage the valves of the piston, and the piston going closer down to the bottom of the barrel, for his pump has only one By the last of these, the air was extracted more perfectly at each stroke By the second he remedied an inconvenience arising from the valve-hole of the piston being too wide properly to support the bladder valve which covered it instead of the usual circular orifice, Mr Smeaton perforated the piston with seven small and equal hexagonal holes, one in the centre, and the other six around, forming together the appearance of a transverse section of a honey-comb, the bars or divisions between which served to support the pressure of the air on the valve His gage consists of a bulb of glass, of a pear-like shape, and capable of holding about half a pound of quicksilver it is open at the lower end, the other terminating in a tube hermetically sealed, and it has annexed to it a scale, divided into parts of about 1-10th of an inch, and answering to the 1000th part of the whole capacity During the exhaustion of the receiver, the gage is suspended in it by a wire,\* but when the pump has been worked as much

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as necessary, the gage is pushed down, till the open end be immersed in a basin of quicksilver placed underneath. The air is then let into the receiver again, and the quicksilver driven by it from the basin, up into the gage, till the air remaining in it become of the same density as the air without, and as the air always takes the highest place, the tube being uppermost, the expansion will be determined by the number of divisions occupied by the air at the top. This air pump is made to act also as a condensing engine, as some German machines had done before, by the very simple apparatus of turning a cock.

By means of this gage, Mr Smeaton judged that his machine was incomparably better than any former ones, as it seemed to rarefy the air in the receiver 1000, or even 2000 times, while the best of the former construction only rarefied about 140 times: and so the case has since been always understood, an implicit confidence being placed in Mr Smeaton's accuracy, till the fallacy was accidentally detected in the manner related at large by Mr Nairne in the *Philos. Transac.* for the year 1777. From this history it appears that a considerable difference always subsisted between the measures of exhaustion furnished by the pear-gage, and the usual long and short tube gages, a difference which was ascribed by the hon. Mr Cavendish to moisture. Hence, Mr Nairne concluded that, if he were to void moisture as much as possible, the two gages should nearly agree. And in fact they were found so to do, each shewing a rarefaction of about 600 when all moisture was perfectly cleared away from the pump, and the plate and the edges of the receiver were secured by a cement instead of setting it upon a soaked leather, as in the usual way.

A very important improvement is that by Mr Cuthbertson, then of Amsterdam, but now of London, which we shall here describe but must be allowed to observe, beforehand that the same construction was invented, and in part executed, before the end of 1779, by Dr Daniel Rutherford, now professor of botany in the university of Edinburgh, who was at that time engaged in experiments on the production of air during the combustion of bodies in contact with nitre, and who was vastly desirous of procuring a more complete abstraction of pure aerial matter than could be effected by Mr Smeaton's pump. The doctor's dissertation on this subject was read in the Philosophical Society of Edinburgh. In this dissertation the doctor appears fully apprised of the existence of pure vital air in the nitrous acid as its chief ingredient, and as the cause of its most remarkable phenomena, and to want but a step to the discoveries which have ennobled the name of M Lavoisier. He was particularly anxious to obtain apart this distinguishing ingredient in its composition, and, for this purpose, to abstract completely from the vessel in which he subjected it to examination every particle of elastic matter. It was proposed to him to cover the bottom of Mr Smea-

ton's piston with some clammy matter, which should take hold of the bottom valve, and start it when the piston was drawn up. Soon after, the doctor shewed a drawing of a pump, having a conical metal valve in the bottom, furnished with a long slender wire, sliding in the inside of the piston-rod with a gentle friction, sufficient for lifting the valve, and secured against all chance of failure by a spring a top, which took hold of a notch in the inside of the piston rod about a quarter of an inch from the lower end, so as certainly to lift the valve during the last quarter of an inch of the piston's motion. Being an excellent mechanic, he had executed a valve on this principle, and was fully satisfied with its performance. But having already confirmed his doctrine respecting the nitrous acid by incontrovertible experiments, his wishes to improve the air pump lost their excitement and he thought no more of it, and not long after this, the ardour of the philosophers of the Teylerian Society at Harlem and Amsterdam excited the efforts of Mr Cuthbertson, their instrument-maker, to the same purpose, and produced one of the most perfect air-pumps that has yet appeared. We shall give a description of it, and an account of its performance, in the inventors own words.

*Cuthbertson's Air Pump* — In pl 10 is a perspective view of this pump, with its two principal gages screwed into their places. These need not be used together, except in cases where the utmost exactness is required. In common experiments one of them is removed, and a stop-screw put in its place. When the pear-gage is used, a small round plate, on which the receiver may stand, must be first screwed into the hole at A, but this hole is stopped on other occasions with a screw. When all the three gages are used, and the receiver is exhausted, the stop screw B, at the bottom of the pump, must be unscrewed, to admit the air into the receiver, but when they are not all used, either of the other stop screws will answer this purpose.

A cross-bar for preventing the barrels from being shaken by working the pump or by any accident, is represented by the dotted lines. It is confined in its place, and kept close down on the barrels by two slips of wood NN, which must be drawn out, as well as the screws OO, when the pump is to be taken asunder.

Plate 9 is a section of all the working parts of the pump, except the wheel and rack, in which there is nothing uncommon.

Fig 1 is a section of one of the barrels, with all its internal parts, and fig 2, 3, 4, and 5, are different parts of the piston proportioned to the size of the barrel \* and to one another.

In fig 1 CD represents the barrel, F the collar of leathers, G a hollow cylindrical vessel to contain oil. R is also an oil-vessel to re-

\* The piston and barrel are 1.65 inches in diameter, in proportion to which the scale is drawn. Figures 2, 3, 4, and 5, are, however, of double size.

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draw the oil which is drawn, along with the air, through the hole *a a*, when the piston is drawn upwards, and, when this is full, the oil is carried over with the air, along the tube *T*, into the oil-vessel *G*. *c c* is a wire which is driven upwards from the hole *a a* by the passage of the air, and as soon as this has escaped, it falls down again by its own weight, shuts up the hole, and prevents all return of the air into the barrel. At *d d* are fixed two pieces of brass, to keep the wire *c c* in a vertical direction, that it may accurately shut the hole. *H* is a cylindrical wire or rod which carries the piston *I*, and is made hollow to receive a long wire *g g*, which opens and shuts the hole *L*, and on the other end of the wire *O* is screwed a nut, which, by stopping in the narrowest part of the hole, prevents the wire from being driven up too far. This wire and screw are more clearly seen in fig 2 and 6, they slide in a collar of leather *r r*, fig 2 and 5 in the middle piece of the piston. Fig 4 and 5 are the two mean parts which compose the piston, and when the pieces 3 and 6 are added to it, the whole is represented by fig 2. Fig 5 is a piece of brass of a conical form, with a shoulder at the bottom. A long hollow screw is cut in it, about  $\frac{1}{2}$  of its length, and the remainder of the hole, in which there is no screw is of about the same diameter with the screwed part, except a thin plate at the end which is of a width exactly equal to the thickness of *g g*. That part of the inside of the conical brass in which no thread is cut, is filled with oiled leathers with holes through which *g g* can slide stiffly. There is also a mile screw with a hole in it, fitted to *g g*, serving to compress the leathers *r r*. In fig 4 *a a a a* is the outside of the piston, the inside of which is turned so as exactly to fit the outside of fig 5. *b b* are round leathers, about 60 in number, *c c* is a circular piece of brass of the size of the leather, and *d d* is a screw serving to compress them. The screw at the end of fig 3 is made to fit the screw in fig 5. Now if fig 6 be pushed into fig 5, this into fig 4 and fig 3 be screwed into the end of fig 5, these will compose the whole of the piston, as represented in fig 2. *H* in fig 1 represents the same part as *H* in fig 2, and is that to which the rack is fixed. If, therefore, this be drawn upwards, it will cause fig 3 to shut close into fig 4 and drive out the air above it, and when it is pushed downward, it will open as far as the shoulder *a a* will permit, and suffer air to pass through. A fig 7 is the receiver plate. *B B* is a long square piece of brass, screwed into the under side of the plate, through which a hole is drilled corresponding to that in the centre of the receiver plate, and with three female screws *b, b, c*.

The rarefaction of the air in the receiver is effected as follows. Suppose the piston at the bottom of the barrel. The inside of the barrel, from the top of the piston to *a*, contains common air. When the rod is drawn up, the upper part of the piston sticks fast in the barrel till the conical part connected with the rod

shuts the conical hole, and its shoulder applies close to its bottom. The piston is now shut, and therefore the whole is drawn up by the rack-work, driving the air before it through the hole *a a*, into the oil vessel at *R*, and out into the room by the tube *T*. The piston will then be at the top of the barrel at *a*, and the wire *g g* will stand nearly as represented in the figure just raised from the hole *L*, and prevented from rising higher by the nut *O*. During this motion the air will expand in the receiver, and come along the bent tube *m* into the barrel. Thus the barrel will be filled with air, which, as the piston rises, will be rarefied in proportion as the capacity of the receiver, pipes, and barrel is to the barrel alone. When the piston is moved down again by the rack-work, it will force the conical part fig 5 out of the hollow part fig 4 as far as the shoulders *a a*. Fig 2 will rest on *a a* fig 4, which will then be so far open as to permit the air to pass freely through it, while at the same time the end of *g g* is forced against the top of the hole, and shuts it, in order to prevent any air from returning into the receiver. Thus, the piston moving downwards suffers the air to pass out between the sides of fig 4 and 5, and, when it is at the bottom of the barrel, will have the column of air above it and, consequently, when drawn upwards it will shut, and drive out this air, and, by opening the hole *L* at the same time, will give a free passage to more air from the receiver. This process being continued, the air of the receiver will be rarefied as far as its expansive power will permit. For in this machine there are no valves to be forced open by the elasticity of the air in the receiver, which at last it is unable to effect. There is therefore nothing to prevent the air from expanding to its utmost degree.

It may be suspected here, that as the air must escape through the discharging passage *a c*, fig 1 against the pressure of a column of oil and the weight of the wire, there will remain in this passage a quantity of air of considerable density, which will expand again into the barrel during the descent of the piston, and thus put a stop to the progress of rarefaction. This is the case in Mr Smeaton's pump, and all which have valves in the piston. But it is the peculiar excellency of this pump, that whatever be the density of the air remaining in *a c* the rarefaction will still go on. It is worth while to be perfectly convinced of this. Let us suppose that the air contained in *a c* is  $\frac{1}{10}$  part of the common air which would fill the barrel, and that the capacity of the barrel is equal to that of the receiver and passages, and that the air in the receiver and barrel is of the same density, the piston being at the bottom of the barrel the barrel will therefore contain  $\frac{11}{10}$  parts of its natural quantity, and the receiver  $\frac{1}{10}$ . Now let the piston be drawn up. No air will be discharged at *a c*, because it will contain the whole air which was in the barrel, and which has now collapsed into its ordinary bulk. But this does not in the least hinder the air of the receiver from expanding into the

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barrel, and diffusing itself equally between both. Each will now contain  $\frac{1}{1000}$  of their ordinary quantity when the piston is at the top, and *a c* will contain  $\frac{1}{1000}$  as before, or  $\frac{1}{1000}$ . Now push down the piston. The hole *L* is instantly shut, and the air in *a c* expands into the barrel, and the barrel now contains  $\frac{1}{1000}$ . When the piston has reached the bottom, let it be again drawn up. There will be  $\frac{1}{1000}$  discharged through *c*, and the air in the receiver will again be equally distributed between it and the barrel. Therefore the receiver will now contain  $\frac{2}{1000}$ . When the piston reaches the bottom, there will be  $\frac{1}{1000}$  in the barrel. When again drawn up to the top, there will be  $\frac{2}{1000}$  discharged, and the receiver will contain  $\frac{2}{1000}$ , and when the piston reaches the bottom there will be  $\frac{1}{1000}$ . At the next stroke the receiver will contain only  $\frac{1}{1000}$ , &c &c

Thus it appears, that notwithstanding the  $\frac{1}{1000}$  which always expands back again out of the hole *a c* into the barrel, the rarity of the air in the receiver will be doubled at every stroke. There is therefore no need of a subsidiary air-pump at *c*, as in the American air-pump, and in the Swedish attempt to improve Smeaton's.

In using this air-pump no particular directions are necessary, nor is any peculiar care requisite for keeping it in order, except that the oil-vessel *A* be always kept about half full of oil. When the pump has stood long without being used, it will be proper to draw a tablespoonful of olive-oil through it, by pouring it into the hole in the middle of the receiver-plate when the piston is at the bottom of the barrel. Then, by working the piston, the oil will be drawn through all the parts of the pump, and the surplus will be driven through the tube *T* into the oil vessel *G*. Near the top of the piston-rod at *H* there is a hole which lets some oil into the inside of the rod, which gets at the collar of leathers *rr*, and keeps the wire *gg* air-tight.

When the pump is used for condensation at the same time that it rarefies, or separately, the piece containing the bent tube *T* must be removed, and fig 8 put into its place, and fixed by its screws. Fig 8 as drawn in the plate, is intended for a double-barrelled pump. But for a single barrel only one piece is used, represented by *b a a*, the double piece being cut off at the dotted line *a a*. In this piece is a female screw to receive the end of a long brass tube, to which a bladder (if sufficient for the experiment of condensation), or a glass, properly secured for this purpose, must be screwed. Then the air which is abstracted from the receiver on the pump-plate will be forced into the bladder or glass. But if the pump be double, the apparatus fig 8 is used, and the long brass tube screwed on at *c*.

Fig 9 and 10 represent the two gages, which will be sufficiently explained afterwards.

Fig 9, is screwed into *c b*, or into the screw at the other end of *c* fig 7 and fig 10 into the screw *a b* fig. 7.

If it be used as a single pump, either to rarefy or condense, the screw *K*, which fastens the rack to the piston-rod *H*, must be taken out. Then turning the wheel till *H* is depressed as low as possible, the machine will be fitted to exhaust as a single pump, and if it be required to condense, the direction in No 8 must be observed with regard to the tube *T*, and fig 8.

"I took," says Mr Cuthbertson, "two barometer tubes of an equal bore with that fixed to the pump. These were filled with mercury four times boiled. They were then compared, and stood exactly at the same height. The mercury in one of them was boiled in it four times more, without making any change in their height, they were therefore judged very perfect. One of these was immersed in the cistern of the pump-gage and fastened in a position parallel to it, and a sliding scale of one inch was attached to it. This scale, when the gage is used, must have its upper edge set equal with the surface of the mercury in the led tube after exhaustion, and the difference between the height of the mercury in this and in the other barometer-tube may be observed to the  $\frac{1}{100}$  of an inch, and being close together, no error arises from their not being exactly vertical, if they are only parallel. This gage will be better understood by inspecting fig 10.

"I used a second gage, which I shall call a double syphon. See fig 9. This was also prepared with the utmost care. I had a scale for measuring the difference between the height of the columns in the two legs. It was an inch long and divided as the former, and I kept in a truly vertical position, by suspending it from a point with a weight hung to it, as represented in the figure. Upon comparing these two gages, I always found them to indicate the same degree of rarefaction. I also used a par-gage, though the most imperfect of all, in order to repeat the curious experiments of Mr Nairne and others.

When experiments require the utmost rarefying power of the pump, the receiver must not be placed on leather, either oiled or soaked in water, as is usually done. The pump-plate and the edge of the receiver must be ground very flat and true, and this with very fine emery, that no roughness may remain. The plate of the pump must then be wiped very clean and very dry, and the receiver rubbed with a warm cloth till it become electrical. The receiver being now set on the plate, hog's lard, either alone, or mixed with a little oil which has been cleared of water by boiling, must be smeared round its outside edge. In this condition the pump will rarefy as utmost and what still remains in the receiver will be permanent air. Or a little of this composition may be thinly smeared on the pump-plate, this will prevent all risk of scratching it with the edge of the receiver. Leather of very uniform thickness, long dried before a fire, and

## A I R - P U M P .

well soaked in this composition, which must be cleared of all water by the first boiling, will answer very well, and is expeditious, when receivers are to be frequently shifted. Other leathers should be at hand soaked in a composition containing a little resin. This gives it a clamminess which renders it impermeable to air and is very proper at all joints of the pump, and all apparatus for pneumatic experiments. As it is impossible to render the pear-gage as dry as other parts of the apparatus, there will be generally some variation between this and the other gages.

When it is only intended to show the utmost power of the pump, without intending to ascertain the quality of the residuum, the receiver may be set on wet leather. If, in this condition, the air be rarefied as far as possible, the syphon and barometer-gage will indicate a less degree of rarefaction than in the former experiments. But when the air is let in again, the pear-gage will point out a rarefaction some thousands of times greater than it did before. If the true quality of permanent air after exhaustion be required the pear-gage will be nearest the truth. For, when the air is rarefied to a certain degree the moistened leather emits an expansible fluid, which, filling the receiver, forces out the permanent air, and the two first gages indicate a degree of exhaustion which relates to the whole elastic matter remaining in the receiver, viz. to the expansible fluid together with the permanent air, whereas the pear-gage points out the degree of exhaustion, with relation to the permanent air alone, which remains in the receiver, for, by the pressure of the air admitted into the receiver, the elastic vapour is reduced to its former bulk, which is imperceptible.

Many bodies emit this elastic fluid when the pressure of the air is much diminished, a piece of leather, in its ordinary damp state, about an inch square, or a bit of green or dry wood, will supply this for a great while.

When such fluids have been generated in any experiments, the pump must be carefully cleared of them, for they remain not only in the receiver, but in the barrels and passages, and will again expand when the exhaustion has been carried far.

The best method of clearing the pump is to take a very large receiver, and to use every precaution to exhaust it as far as possible. Then the expansible matter lurking in the barrels and passages will be diffused through the receiver also, or will be carried off along with its air. It will be as much rarer than it was before, as the aggregate capacity of the receiver barrels and passage is larger than that of the two last.

The performance of the pump may be judged of from the four following experiments.

The two gages being screwed into their places and the hole in the receiver-plate shut up, the pump was made to exhaust as far as it could. The mercury in the legs of the syphon was only  $\frac{1}{10}$  of an inch out of the level and that in the boiled barometer tube  $\frac{1}{20}$  of an inch higher than in the one screwed to the pump.

A standard barometer then stood at 30 inches, and therefore the pump rarefied the permanent air 1200 times. This is twice as much as Mr. Nairne found Mr. Sincaton's do in its best state. Mr. Cavallo seems disposed to give a favourable (while we must suppose it a just) account of Hues and Hurter's pump, and it appears never to have exceeded 600 times. Mr. Cuthbertson has often found the mercury within  $\frac{1}{100}$  of an inch of the level in the syphon-gage, indicating a rarefaction of 3000.

To one end of a glass tube, 2 inches diameter and 30 inches long, was fitted a brass cap and collar of leather, through which a wire was inserted, reaching about two inches within the tube. This was connected with the conductor of an electric machine. The other end was ground flat and set on the pump-floot. When the gages indicated a rarefaction of 300, the light became steady and uniform, of a pale colour though a little tinged with purple, at 600 the light was of a pale dusky white, when 1200 it disappeared in the middle of the tube, and the tube conducted so well that the prime conductor only gave sparks so faint and short as to be scarcely perceptible. After taking off the tube, and making it as dry as possible it was again connected with the conductor, which was giving sparks two inches long. When the air in it was rarefied ten times, the sparks were of the same length. Sometimes a pencil of light darted along the tube. When the rarefaction was 20, the spark did not exceed an inch, and light streamed the whole length of the tube. When the rarefaction was 30, the sparks were half an inch, and the light rushed along the tube in great streams. When the rarefaction was 100, the sparks were about  $\frac{1}{2}$  long and the light filled the tube in an uninterrupted body. When 300, the appearances were as before. When 600 the sparks were  $\frac{1}{3}$ , and the light was of a faint white colour in the middle, but tinged with purple toward the ends. When 1200, the light was hardly perceptible, and was much fainter at the ends than before, but still ruddy. When 1400, which was the most the pump could produce, six inches of the middle of the tube were quite dark, and the ends free of any tinge of red, and the sparks did not exceed  $\frac{1}{20}$  of an inch.

Many other ingenious attempts have been made during the last ten years to improve the mechanism of the air pump, to describe a fourth part of which would lead us far beyond our limits. Justice, however to the authors of these improvements, as well as a desire to gratify the reader, induces us to refer to Nicholson's Journal, vols. 1 and 11 4to for descriptions of the pumps invented by Messrs Prince, Sadler, Little, Sir G. Mackenzie, &c., to the Retrospect of Philosophical Discoveries, vol. 11, for accounts of the simple inventions of Wright and Silvester, and to Mr. Professor Vince's Hydrostatics, for an account of the air-pump used by that gentleman in his lectures.

We beg to be indulged in one remark, that, although this noble instrument originated in Germany, all its improvements were made in

# AIR-PUMP

this kingdom Both the mechanical and pneumatical principles of Mr Boyle's construction were extremely different from the German, and in respect of expedition and convenience much superior The double barrel and gage by Hawksbee were capital improvements, and on principle Mr Smeaton's method of making the piston work in rarefied air made a complete change in the whole process and the improvements of Rutherford (essentially the same as Cuthbertson's), MacKenzie, and others just named, have now left us little to expect from any further attempts

*The Use and Effect of the Air Pump*—In whatever manner or form this machine is made, its use and operation are much the same By means of the motion of the handle, a barrel of the contained air is drawn out at every stroke of the piston, in the following manner by pushing the piston down to the bottom of the barrel, where the air is prevented from escaping downward, by its elasticity it opens the valve of the piston and escapes upwards above it into the open air, then raising the piston up, the external atmosphere shuts down its valve and vacuum would be made below it but for the air in the receiver, pipe, &c., which now runs the valve in the bottom of the barrel, and when it is raised again, till the whole air in the receiver and barrel be of one uniform density but less than it was before the stroke in proportion to the sum of all the capacities of the receiver, pipe and barrel together is to the same sum wanting the barrel And thus is the air in the receiver diminished at each stroke of the piston by the quantity of the barrel or cylinder full and therefore always in the same proportion so that by thus repeating the operation again and again, the air is rarified to any proposed degree or till it is not elastic enough to open the valve of the piston or of the barrel, after which the exhaustion cannot be any farther carried on the gauge in comparison with the barometer showing at any time what the degree of exhaustion is according to the particular nature and construction of it

But, supposing no vapour from moisture, &c. to rise in the receiver, the degree of exhaustion after any number of strokes of the piston, may be determined by knowing the respective capacities of the barrel and the receiver, including the pipe, &c. For as we have seen above that every stroke diminishes the density in a constant proportion, namely, as much as the whole content exceeds that of the cylinder or barrel, and consequently the sum of as many diminutions is there the strokes of the piston, will show the whole diminution by all the strokes So, if the capacity of the barrel be equal to that of the receiver, in which the communication pipe is always to be included then, the barrel be no half the sum of the whole contents, half the air will be drawn out at one stroke, and consequently the remaining half, being diluted through the whole or first capacity, will be of only half the density of the first in like manner, after the

second stroke, the density of the remaining contents will be only half of that after the first stroke, that is only  $\frac{1}{2}$  of the original density continuing this operation, it follows that the density of the remaining air will be  $\frac{1}{2}$  after 3 strokes of the piston,  $\frac{1}{4}$  after 4 strokes,  $\frac{1}{8}$  after 5 strokes and so on, according to the powers of the ratio  $\frac{1}{2}$  that is such power of the ratio as is denoted by the number of the strokes In like manner if the barrel be  $\frac{1}{3}$  of the whole content, that is, the receiver double of the barrel or  $\frac{2}{3}$  of the whole contents then the ratio of diminution of density being  $\frac{1}{3}$ , the density of the contents after any number of strokes of the piston, will be denoted by such power of  $\frac{1}{3}$  whose exponent is that number; namely, the density will be  $\frac{1}{3}$  after one stroke,  $(\frac{1}{3})^2$  or  $\frac{1}{9}$  after two strokes  $(\frac{1}{3})^3$  or  $\frac{1}{27}$  after 3 strokes, and in general it will be  $(\frac{1}{3})^n$  after  $n$  strokes the original density of the air being 1 Hence then generally, if  $s$  denote the sum of the contents of the receiver and barrel, and  $r$  that of the receiver only without the barrel, and  $n$  any number of strokes of the piston, then, the original density of the air being 1, the density after  $n$  strokes will be  $(\frac{r}{s})^n$  or  $\frac{r^n}{s^n}$ , namely

by the  $n$  power of the ratio  $\frac{r}{s}$  So, for example, if the capacity of the receiver be equal to 4 times that of the barrel, then their sum is 5, and  $r$  is 4, and the density of the contents after 30 strokes will be  $(\frac{4}{5})^{30}$ , or the 30th power of which is  $\frac{1}{100}$  nearly, so that the air in the receiver is rarefied 100 times

See also the *Memoires de l'Academy des Sciences* for the years 1693 and 1703

From the same formula namely  $(\frac{r}{s})^n = d$  the density, we easily derive a rule for finding the number of strokes of the piston necessary to rarefy the air any number of times, or to reduce it to a given density  $d$  out of the natural air being 1 For since  $(\frac{r}{s})^n = d$ , by taking the logarithm of this equation, it is  $n \times \log r = \log s$  of  $d$ , and hence  $n = \frac{\log s}{\log r - \log s}$

that is, divide the log of the proposed density by the log of the ratio of the receiver to the sum of the receiver and barrel together, and the quotient will show the number of strokes of the piston requisite to produce the degree of exhaustion required So, for example, if the receiver be equal to 5 times the barrel, and it be proposed to find how many strokes of the piston will rarefy the air 100 times, then  $r = 5$ ,  $s = 6$   $n = \frac{\log 6}{\log 5 - \log 100}$  whose log

$$2, \text{ and } \frac{r}{s} = \frac{5}{6} \text{ whose log is } -.07918,$$

therefore  $\frac{-.2}{-.07918} = 25\frac{1}{2}$  nearly, which is the number of strokes required

Some of the principal effects and phenomena of the air pump are following That,

## AIR

in the exhausted receiver, heavy and light bodies fall equally swift, so, a guinea and feather fall from the top of a tall receiver to the bottom exactly together. That most animals die in a minute or two but, however, that vipers and frogs, though they swell much, live an hour or two, and after being seemingly quite dead, come to life again in the open air that snails survive about ten hours after, or slow-worms, two or three days, and leeches five or six. That oysters live for 24 hours. That the heart of an eel taken out of the body continues to beat for good part of an hour, and that more briskly than in the air. That warm blood, milk, gall, &c. undergo a considerable intumescence and ebullition. That a mouse or other animal may be brought, by degrees, to survive longer in a rarified air, than naturally it does. That air may retain its usual pressure, after it is become unfit for respiration. That the eggs of silk-worms hatch in vacuo. That vegetation stops. That fire extinguishes, the flame of a candle usually going out in one minute, and a charcoal in about five minutes. That red-hot iron, however, seems not to be affected, and yet sulphur or gunpowder are not lighted by it, but only fused. That a match, after lying seemingly extinct a long time, revives again on readmitting the air. That a flint and steel strike sparks of fire is copiously, and in all directions, as in air. That magnets, and magnetic needles, act the same as in air. That the smoke of an extinguished luminary gradually settles to the bottom in a darkish body, leaving the upper part of the receiver clear and transparent, and that on inclining the vessel sometimes to one side and sometimes to another, the smoke preserves its surface horizontal after the nature of other fluids. That heat may be produced by attrition. That camphire will not take fire, and that gunpowder, though some of the grains of a heap of it be kindled by a burning glass, will not give fire to the contiguous grains. That glow worms lose their light in proportion as the air is exhausted, and at length become totally obscure, but on readmitting the air, they presently recover it all. That a bell on being struck, is not heard to ring, or very faintly. That water freezes. But that a syphon will not run. That electricity appears like the aurora borealis. With multitudes of other curious and important particulars, to be met with in the numerous writings on this machine, namely, besides the *Philos. Transactions* of most academies and societies, in the writings of Torricelli, Pascal, Merenne, Guericke, Schottus, Boyle, Hook, Duhamel, Mariotte, Hawksbee, Hales, Muschenbroeck, Gravenande, De Saugliers, Franklin, Cotes, Helshim, Martin, Ferguson, Adams, Nicholson, Cavallo, Gregory, Hutton, &c.

**AIR-SHAFTS**, among miners, denote holes or shafts let down from the open air to meet the adits, and furnish fresh air. The damps, want and impurity of air which occur, when adits are wrought 20 or 40 fathoms long, make

## AIR

it necessary to let down air-shafts, in order to give the air liberty to play through the whole work, and thus discharge bad vapours, and furnish good air for respiration. The expence of which shafts, in regard of their vast depths, hardness of the rock, drawing of water, &c. sometimes equals, nay exceeds, the ordinary charge of the whole adit.

**AIR-VESSEL**, in hydraulics, is a name given to those metalline cylinders, which are placed between the two forcing-pumps in the improved fire-engines. The water is injected by the action of the pistons through two pipes, with valves, into this vessel, the air previously contained in it will be compressed by the water, in proportion to the quantity admitted, and by its spring force the water into a pipe, which will discharge a constant and equal stream, whereas in the common squirting engine, the stream is discontinued between the several strokes.

**AIR-VESSELS**, in botany, are certain canals, or ducts, by which a kind of absorption and respiration is effected in vegetables. Air vessels are distinguished from sap-vessels, the former being supposed to correspond to the trachea and lungs of animals, the latter to their lacteals and blood-vessels. Air-vessels are found not only in the trunks or stems, but also in the leaves of all plants, and are easily discoverable in many without the help of glasses, for upon breaking the stalk or chief fibres of a leaf the likeness of a fine woolly substance, or rather of curious small cobwebs, may be seen to hang at both the broken ends, and this is really a stream of air-vessels. See *Grew's Anat. of Roots*, ch. iv. p. 155, &c. See also *Darwin's Phytologia*, where the air-vessels and the absorbents of plants are very ingeniously distinguished.

**AIRY** *a* (from *air*, *aerius*, Lat.) 1 Composed of air (*Bacon*) 2 Relating to the air (*Boyle*) 3 High in air (*Addison*) 4 Open to the free air (*Speiser*) 5 Light as air unsubstantial (*Shakespeare*) 6 Without reality, vane, trifling (*Temple*) 7 Fluttering loose, full of levity (*Dryden*) 8 Gay, sprightly, full of mirth, vivacious, lively, light of heart (*Taylor*)

**AIRY TRIPICITY**, in astrology, the signs Gemini, Libra, and Aquarius.

**AISI**, a river of France which runs into the Orne, three leagues above Caen.

**AISLE**, *s* The walk in a church (*Addison*)

**AISNE**, in geography, a river of France, which rises in Champagne, runs by Soissons, and falls into the Oise above Compiègne. It gives name to a department which is one of six formed of the old vast Soissonnois, le Basois, and le Vexin Francois, and is one of the five into which the ancient Isle of France is divided.

**AISTHESIS** (*αισθησις*, from *αισθαναι*, *to perceive*) A sense, either external, as the sight, touch, &c. or internal, as the memory, judgment, &c.

**AISTHETEURION** (*αισθητηριον*, from *αισθη-*



## A J U

*visus, to perceive*) The sensory, or seat and origin of sensation See **SENSORIUM COMMUNE**

**AIT** *s.* A small island in a river

**AITONA**, in geography, a small town of Spain in Catalonia, the capital of a marquisate

**ATTONIA** In botany, a genus of the class and order monadelphia octandria, so named in honour of Mr Auton, the royal and truly-scientific gardener at Kew It is thus characterised, calyx four-parted, petals four, style one, berry dry, quadrangular, one-celled, many-seeded The only known species is a cape-shrub with blue-colour flowers

**AJUCA** Bugle ground pine A genus of the class and order didyma gymnospermia Its corol with the upper lip very minute and emarginate stamens longer than the upper lip It includes ten species found in different parts of Europe and Asia of which two are common to our own woods and fields The creeping bugle found in the former, and the chamæpitys (common ground pine) frequent in the latter The pyramidalis, a native of Denmark, and other parts of Europe, is still employed in medicine, and constitutes the consolidated matter of the pharmacopœias, which see

**AJUS LOCUTIUS**, a deity to whom the Romans erected an altar, because under that name a supernatural voice had given warning of the attack about to be made on Rome by the Gauls in the time of Camillus

**AJUTAGE** or **ANJUTAGE**, in hydraulics, part of the apparatus of jet d'eau, or artificial fountain, being a kind of tube fitted to the aperture or mouth of the cistern, or the pipe, through which the water is to be played in any direction, and in any shape or figure

It is chiefly the diversity in the ajutage, that makes the different kinds of fountains So that, by having several ajutages, to be applied occasionally one fountain is made to have the effect of many

Mariotte, Gravesande and Desaguliers have written pretty fully on the nature of ajutages, or spouts for jets d'eau, and especially the former He informs, from experiment that in even polished round hole, made in the thin end of a pipe, gives a higher jet than either a cylindrical or a conical ajutage, but that, of these two latter however, the conical is better than the cylindrical figure

The quantity of water discharged by ajutages of equal area, but of different figures, is the same And for like figures, but of different sizes, the quantity discharged is directly proportional to the area of the ajutage, or to the square of its diameter, or of any side or other linear dimension so, an ajutage of a double diameter, or side, will discharge 4 times the quantity of water, of a triple diameter, 9 times the quantity, and so on, supposing them at an equal depth below the surface or head of water But if the ajutage be at different depths below the head, then the celerity with which the water issues, and consequently the quantity of it run out in any given time, is di-

## A I Z

rectly proportional to the square-root of the altitude of the head, or depth of the hole so at 4 times the depth the celerity and quantity is double, at 9 times the depth, triple; and so on

It has been found that jets do not rise quite so high as the head of water, owing chiefly to the resistance of the air against it, and the pressure of the upper parts of the jet upon the lower and for this reason it is, that if the direction of the ajutage be turned a very little from the perpendicular, it is found to spout rather higher than when the jet is exactly upright

It is found by experiment too, that the jet is higher or lower, according to the size of the ajutage that a circular hole of about an inch and a quarter in diameter jets highest, and that the further from that size, the worse Experience also shews that the pipe leading to the ajutage should be much larger than it, and if the pipe be a long one, that it should be wider the further it is from the ajutage Hutton's Dictionary

For the experiments of Bossut on this interesting subject, see Gregory's Mechanics, book ii ch 2

**AIX**, a small island on the coast of France Lat 46 5 N Lon 1 5 W

**AIX**, an ancient city of Provence, in France Lat 43 32 N Lon 5 32 E

**AIX LA CHAPELLE**, a fine city of Westphalia, in Germany It is famous for several councils and treaties of peace concluded here, particularly those between France and England in 1748 It is 26 miles almost E from Liege, and 40 almost W from Cologne Lat 50 50 N Lon 5 48 E

**AIX LA CHAPELLE** A town in the south of France, renowned in medicine and chemistry for its sulphurous water, the most striking feature of which, and what is almost peculiar to it, is the unusual quantity of sulphur it contains, the whole, however, is so far united to a gaseous basis, as to be entirely volatilized by heat so that none is left in the residuum after evaporation This thermal water is much resorted to on the continent, for a variety of complaints It is found essentially serviceable in the numerous symptoms of disorders in the stomach and biliary organs, that follow a life of high indulgence in the luxuries of the table, in nephritic cases, stiffness and rigidity of the joints and ligaments, from rheumatism and gout, in palsy, and in the distressing debility which follows a long course of mercury and excessive salivation

**AIZOON** In botany, a genus of the class and order monandria pentagynia Calyx five-parted, petalless, capsule superior, five-celled, five-valved There are ten species, the greater number of which are indigenous to the Cape Spain owns one and the Canaries one; the a Canariense and the a Hispanicum

**AIZOUM** (*αἰζωον*, from *αι*, always, and *ζωω*, to live) An ever-green aquatic plant, like the aloe

**To AKE** *αἰν* (from *αι*, Gr) To feel a lasting pain (*Take*)



## A L A

**ALFNSIDE** (Mark), an English poet and physician, was born at Newcastle-upon-Tyne, Nov 9, 1721. His father was a butcher, and intending him for the office of a dissenting minister, gave him an education accordingly. At the age of eighteen he was sent to Edinburgh, but instead of divinity he entered on the study of physic. In 1741, he went to London, where, in 1744, he took his degree of M.D. The same year appeared his most celebrated performance, "The Pleasures of Imagination," a poem which being shewn to Mr Pope, he said, "This was no every-day writer." He began to practise as a physician at Northampton, but finding no chance of succeeding there, removed to Hampstead, and his friend Mr Dyson generously allowed him 300*l.* per ann. till he could fix himself in practice. Having been admitted to his doctor's degree at Cambridge, he was elected a fellow of the college of physicians, and one of the physicians of St Thomas's Hospital, and on the establishment of the queen's household, he was appointed one of her majesty's physicians. In 1764, he printed a discourse in Latin on the dysentery, and was in a fair way of attaining considerable eminence in his profession, when he was taken off by a putrid fever, June 23, 1770. His remains were interred in the church of St James, Westminster. The poem on "The Pleasures of Imagination" was published in an elegant form, with a classical preface, by Mrs Barbauld, in 1795.—*Watkins*

**AKIBA**, a Jewish rabbi, was at first a scribe, but at the age of forty devoted himself to learning, and became a celebrated preacher, first at Lydda, and afterwards at Jerusalem, in the first century. He joined the pretended Messiah Barchochebas, for which, with his son Bappus, he was flayed alive by the Romans, A.D. 135. He was one of the first compilers of the traditionary institutions according to the cabalistic mystics.

**AKIN** a (from *a* and *ku*, 1 Related to blood (*Sidney*) 2 Allied to by nature (*I change*)

**AKISAT**, the ancient Thyatira, a city of Asia, 50 miles from Pergamos. Lat. 38 50 N. Lon. 28 30 E.

**AKOND** an officer of justice in Persia, who takes cognizance of the causes of orphans and widows, of contracts, and other civil concerns.

**AKOUSCHY**, in zoology. See **CAVIA ACUSCHY**.

**AL**, as an Arabic noun, denotes God, heaven, divine, as an Arabic particle, it is prefixed to words to give them a more emphatic signification, signifying much the same with our particle *the* as in *Alkorian*, the Koran, *Alkermes*, the kermes, and in the Arabic astronomy, we have *Al thuraya*, the Pleiades, *Al phera*, *Al nehra*, *Al terpha* &c.

**AL**, or **ALD**, a Saxon term prefixed to the names of places denoting their antiquity, as *Alldorouli*, Aldgate, &c.

**ALA** (*עלה, ala*, a leaf, Heb) 1 A wing

## A L Æ

**PINNA**, which see 2. The arm pit. 3 Any part capable of extension like a wing whence in anatomy we meet with the *alæ*, or wings of the sphenoid bone and in botany find the term applied to the wing like membrane fixed to some seeds by which they fly away and are dispersed, as also to the leafy membrane which runs through the entire length of the stem, to the branch which grows from the stalk like a wing and the hollow or arm-pit which the leaf makes upon a stalk, and whence a new shoot arises.

**ALABA** or **ALAVA** a subdivision of Biscay in Spain. There are plentiful mines of iron and steel.

**ALABARCHA**, a magistrate whom the emperors permitted the Jews of Alexandria to elect to decide their disputes, &c.

**ALABASTER**. See **GYPsum** and **INOLITHUS**.

**ALABASTER** (William), an English divine, born at Hadley, in the county of Suffolk. He was one of the doctors in Trinity-college, in Cambridge, but turned to the Roman communion, however, being soon dissatisfied with his new religion, he again became a Protestant and obtained a prebend in the cathedral of St Paul, and after that the rectory of Therfield, in Hertfordshire. He was well skilled in the Hebrew tongue, and was strangely infatuated with the Caballa. He gave a proof of his fondness for mystical interpretations in the sermon he preached at his taking the degree of doctor of divinity when he took for his text the words "Adam, Seth, Enos, and endeavoured to prove that each of these words contained a hidden mystery. He wrote a Latin tragedy, entitled *Rosam*, which, when it was acted in a college at Cambridge, was attended with a remarkable circumstance, for a lady was so terrified at the last words, *Sequitur sequar*, which were pronounced in a very shocking tone, that it is said she lost her senses, and never again recovered them. He wrote a Hebrew Lexicon in folio, and several other works. He was living, in 1639.

**ALABASTRA** (*αλαβαστρα*, from *αλ. βασι*, a box of perfume) The bud of a flower or the calyx that supports it, so called from its shape and odour, the former resembling the ancient box which contained precious balsams.

**ALACK** (*interj.*) *Alas!* an expression of sorrow (*Shal spare*)

**ALACKADAY** (*interj.*) A word denoting sorrow and melancholy.

**ALACROUSLY** *ad.* Cheerfully, without dejection (*Gov of the Tongue*)

**ALACRITY** *s.* (*alacritas*, Lat.) Cheerfulness, spiritfulness, gaiety (*Dryden*)

**ALÆ** (the plural of *ala*) The nymphæ.

**ALÆ NASTI**. The lateral or moveable parts of the nose. *Pinna nasi*.

**ALÆ VESPERTILIONUM** (*vespertilio*, *quod vesper volit*) That part of the ligament of the womb which lies between the tubes and the ovaria so called from its resemblance to the wings of the vespertilio, or bat.

## A L A

**ALÆ** In botany, the two side petals of a papilionaceous flower (See **WINGS**) The angle formed by a branch with the stem, or by a leaf with the branch, was formerly expressed by this term, but it is now called the *axilla* or *axil*; which see

**ALATA PHLETHIS** (from *αλατο*, *blind* and *φθις*, *a wasting*) Lamefaction from a catarrh or coryza

**ALAGIAGA** See **DIPUS**, or **JARBOA**

**ALAI COMENIUS**, the Bohemian name for the Athenian month Mamecticion

**ALAMANDA** In botany a genus of the class and order pentandria monogynia Its corol is twisted, capsule lens formed, erect, echinate, one-celled, two-seeded, many seeded The only known species is a native of Guiana, a climbing milky plant with yellow, terminal flowers, the leaves of which in an infusion are esteemed useful in the colic and other diseases of the alimentary canal

**ALAMANNICUM**, a tribute imposed by the emperor Alexius Angelus, on obtaining a peace with the Alimanni

**ALAMBIC** See **ALAMBIC**

**AL-AMIRI**, in the gammut is the octave above **AL-RE**, or **A** in the first space in the bass cleff

**ALAMODE**, a phrase originally French, importing a thing to be in the fashion or mode

**ALAMODE** in commerce, a thin glossy black silk, chiefly used for women's cloaks and men's mourning veils

**ALANABOLUS** (*αλαναβολος* from *αλανο*, *only*, and *βολο*, *earth*) English otter

**ALAND ILLRA** The same as *ilana-bolus*

**ALAND** or **ALANDT** an island belonging to Sweden, in the Baltic, about forty leagues in circumference, encompassed with small islands and rocks, it was anciently independent, but now makes part of Finland Cutholm is the principal place Lat 60 18 N Lon 37 40 E **ALAND**

**ALAND** a river of Germany which runs into the Elbe near Snickenburg, in the principality of Lauenburg

**ALAND** *ail* (from *a* for *at* and *land*) At land lunded on the dry ground (*Dryd*)

**ALANDATRAL** (*lutter*, Arab) The bitter-apple, or colocynth

**ALANDSBAY**, on the south coast of Ireland, between Waterford harbour and Trimore bay eight miles S of Waterford

**ALANGIUM** In botany, a genus of the class and order polyandria monogynia Calyx six or ten-toothed, superior petals six or ten, berry barky, two or three seeded There are two species both of which are natives of India

**ALANORARIUS**, anciently, a manager of dogs for hawking

**ALANS**, or **ALANI**, a people who, like the Huns, were of Asiatic origin, but represented by Ammianus Marcellinus, as "victu mitiores et cultu, more polished in their customs and manners Phny (H N lib iv c 12) erroneously places them in Europe,

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beyond the mouth of the Danube but Josephus (*De Bell Jud*, lib vii c 29) traces their origin more accurately, and describes them as Scythians who dwelt between the river Tanus and the lake Meiot

**ALANTOID** See **ALANTOID**

**ALARAF**, in the Mahometan theology, the partition wall that separates heaven from hell The word is plural, and properly written al arif, in the singular it is written al arf It is derived from the Arabic verb *arafa*, to distinguish

**ALARBI**, a name given to those Arabians who live in tents, and distinguish themselves by their dress from others who live in towns

**ALARL EXTERNUM** (from *alaris*, winged and *externum*, outward) A name of the external pteregoid muscle, so called because it rises from the pinnated process of the sphenoid bone

**ALARFS** in antiquity, are supposed by some authors to have been a kind of militia, or soldiery, among the Romans, so called from *ala*, a wing, because of their lightness and swiftness in the combat Others make them a people of Pannonia, but others, with more probability, take alares for an adjective, or epithet, and apply it to the Roman cavalry, because placed in the two wings, or alæ, of the army, for which reason, a body of horse was called *ala*

**ALARIA OSSA** (*alaris*, winged) The pennated or wing-like processes of the sphenoid bone

**ALARICUS**, a famous king of the Goths who plundered Rome in the reign of Honorius He was greatly respected for his military valour, and during his reign he kept the Roman empire in continual alarm He died after a reign of 13 years A D 410

**ALARM** (from the Fr *a larme*, to arms) 1 A cry by which men are summoned to their arms (*Pope*) 2 Notice of any danger approaching 3 Any tumult or disturbance (*Pope*)

To **ALARM** 1 *a* 1 To call to arms (*Ad-dison*) 2 To surprise with the apprehension of any danger (*Liechl*) 3 To disturb in general (*Dryden*)

**ALARM**, or rather **ALARUM**, is also used for an instrument to awaken persons at a certain hour one very simple contrivance of this kind is used by weavers See **WEAVER'S ALARM**

Plate 2 is a representation of a modern alarm clock of the most approved construction A is the in un arbor on which is fixed a wheel B with a groove on the edge to receive a line D, to whose end a weight is attached, the wheel B is at liberty to turn round without the arbor in one direction but is prevented from returning by a click fixed to the wheel which acts against the arms of the great wheel F, this being firmly attached to the arbor The clock is wound up, by pulling down that end of the line which has no weight; this turns the pulley D without the arbor, the click slip

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ping over the arms of the wheel E, when the weight is permitted to descend, the click takes hold of the wheel, and by turning it, keeps the clock in motion. The wheel F turns a pinion on the arbor *f*, which also carries a wheel I, this wheel turns the contrate wheel G by a pinion on its arbor, the contrate wheel turns a pinion on the arbor of the balance wheels H, in which the pallets of the verge *k* play. As the pendulum vibrates, the teeth of the balance-wheel escape from the pallets, one at a time, and allow the weight to turn the wheel of the machine, the number of teeth in which must be such, that the great wheel I shall revolve once in two hours. The pinion *d* on the end of the arbor A has 8 leaves, and turns the wheels *b*, of 48 teeth, once round in 12 hours. Its arbor carries the hand I, by which the time is noted on the dial-plate (supposed to be removed). K is a pulley similar to B, which turns round on a pin fixed in the back plate of the machine, its click turns a crown wheel I, which works a verge similar to that of the escapement before described, the upper end of this verge is bent, and carries a hammer which strikes the inside of the bell M. The wheel L has a pin projecting from it circumference, which falls against the end of a lever *m*, and prevents the weight N from turning the wheel until the lever is raised, by means of another lever *n* fixed on the same axis. The arbor of the hour wheel *b* is not fastened to the wheel itself, but to the circular plate O, fig. 2 against which the wheel is pressed by a pin put through the arbor behind the wheel, so as to cause a considerable friction, which makes the arbor and hand attached to it to turn with the wheel but the hand may at any time be moved independently of the wheels in directing the clock's time. P is a collar that fits on the arbour, and has two springs of thin brass at its end, which press against the plate O, and make the collar move somewhat all on the arbor, Q is a click put on the end of the collar, so as to turn with it this click, and has the 12 hours engraven on it, and they are read by the short end of the hand I. These parts are put together, by first placing the wheel I behind the plate O and pinning it on, the collar P is put on, and next the arbor is put in its place in the machine, and the dial placed on, the circle Q is fixed in its place the hands next, and lastly all is secured by a pin, put through the arbor beyond the hand. One of the springs of the collar P has a pin projecting from it, which, as the collar turns round, takes the end of the lever *n*, and raises it up, the lever *m* is raised at the same time, so as to set the alarm in motion. When the machine is to be used, both weights must be drawn up, and the circle Q turned round, so as to bring the short end of the hand I to the figure on the plate, corresponding to the hour when the alarm is wished to go off. As the hand I turns round by the action of the great weight it carries the collar and click Q with it, till the hand comes to the same hour on the dial, when the pin in the spring, lifts up the lever *n*, and

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also the lever *m*, so as to allow the pin in the wheel L to pass by, as the wheel turns round by the action of the weight, it throws the hammer backwards and forwards against the inside of the bell, as shown in fig. 3.

**ALARM-BELL** *s* (from *alarm* and *bell*) The bell that is rung at the approach of an enemy. This is what the French call *locsin*.

**ALARMING** *particip a* (from *alarm*) Terrifying, awakening, surprising.

**ALTRIMOSI** *s* (from *ala m* and *post*) The post appointed by each body of men to appear at, when in alarm shall happen.

**ALAS!** *interject* (*helas*, Fr.) 1 A word expressing lamentation (*Pope*). 2 A word of pity (*Shakspeare*). 3 A word of sorrow and concern (*Milton*).

**ALASCANI**, in church history, a sect of Antilutherans, whose distinguishing tenet besides their denying baptism, is said to have been this, that the words, "Thine I am, body," in the institution of the eucharist are not to be understood of the bread, but of the whole action or celebration of the supper.

**ALATE** *ad* (from *a* and *late*) I lately.

**ALATE** See **WINGED**.

**ALBID ANIMALS**, such as are furnished with wings.

**ALATED LEAVES**, in botany, such as are composed of several pinnated ones. See **PINNATED**.

**ALAI RNOLDS**, in botany, a species of the myrica. See **MERICA**.

**ALAI RNUS** *bitud* See **PHYSICA**.

**ALAI RN** (*alaih*, from the arabic *the*, and *adhesion*, Arab.) An adhesive mineral described by Avicenna.

**ALAUDA** *Ind*. In the Linnæan system the twenty-fifth genus in order six, or passeres, of the class aves. The following is its generic character. Bill cylindrical, subulate, straight, the mandibles equal, and a little gaping at the base; tongue broad, hind claw straight longer than the toe (See Nat Hist. Plate I.) Ornithologists have described upwards of thirty species of this exquisitely musical bird, of which the following are the chief.

1 A *arvensis*. Sly lull, field lull, which inhabits Europe, Asia, and Africa seven inches long. Feeds on fruits and insects, sings sweetly at the earliest dawn, it soars spirally in the air, increasing the volume of its note as it ascends, assembles in vast flocks in winter, when it becomes very fat, builds on the ground beneath a clod, and lays four or five greenish-white eggs with dusky confluent spots. This and the wood-lark are the only birds that sing as they fly. Body, above, variegated with blackish, reddish-grey, and whitish, beneath, reddish-white. Bill and legs black, throat spotted with black. There are four or five varieties.

2 A *pratensis*. Tit lark. Inhabits Europe, in low grounds, five and a half inches long, has a fine note, and sings sitting in trees or on the ground. Bill black, body, beneath white, breast ochre-yellow, with oblong black spots, legs yellowish.

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**3 A arborea** Wood-lark Inhabits Europe and Siberia less than the sky-lark, sits on trees, and whistles like the black-bird sings in the night, and while flying builds on the ground, eggs dusky, with deep brown blotches Head surrounded with a white annular fillet body variegated, like *A. arvensis*, legs flesh-colour

**4 A obscura** Rock-lark Inhabits rocky places in England even a quarter inches long is solitary, and sings but little Its note like the chirp of the grasshopper Bill slender, long, brown, deeper at the tip, tail three inches long, not wedged, legs red-brown, hind-claw hooked, hardly longer than the toe

**5 A cristata** Crested lark Inhabits Europe, six and three-quarters inches long like the bull-lark, learns with ease to repeat tunes played or sung to it, in doing which it articulates every note distinctly, and entirely drops its native warble Bill brown, crest darker than the body, body cinnamon, breast and belly white, with a yellow band tail feathers black, head crested, legs black

**ALAY** signifying, in the Turkish language, 'The Triumph,' is a ceremony which accompanies the assembling together the forces of that vast empire upon the taking out of a war

**ALB**, or **ALBE** in the Romish church, a vestment of white linen hanging down to the feet, and answering to the surplice of the English clergy In the ancient church, it was used with those newly baptised to wear an alb, or white vestment, and hence the Sunday after Easter was called dominica in albis, on account of the albs worn by those baptised on Easter day

**ALB** is also the name of a Turkish coin, otherwise called Asper

**ALB** a river of Germany which rises three miles WNW Wildbad in the circle of Swabia, and runs into the Rhine, above five miles WNW Durlach

**ALBA**, surnamed Pompeii, and celebrated by Ptolemy and other ancient authors, is one of the principal cities of Old Liguria, but having been in the hands of many masters it has lost its ancient splendour It is situated in the duchy of Montferrat and is 22 miles S E of Turin Lat 44 50 N Lon 8 5 E

**ALBA FIRMA**, in old customs, rent paid in silver

**ALBA TERRA**, one of the many names that were given by alchemists to the philosopher's stone

**ALBADARA**, (*albadan*, Arab) The bone of the first joint of the great toe

**ALBAGEASI**, (Arab) the process of the os sacrum

**ALBAMENTUM**, (from *allus*, white) The albumen or white of the egg

**ALBAN** (St), is said to have been the first person who suffered martyrdom for christianity in Britain, he is therefore usually styled the protomartyr of this island He was born at Verulam, and flourished towards the end of the third century In his youth he took a journey

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to Rome, in company with Amphibalus a monk of Caerleon, and served seven years as a soldier under the emperor Dioclesian At his return home, he settled in Verulam, and, through the example and instructions of Amphibalus, renounced the errors of paganism, in which he had been educated, and became a convert to the Christian religion It is generally agreed, that Alban suffered martyrdom during the great persecution under the reign of Dioclesian, but authors differ as to the year when it happened Bede and others fix it in 286, some refer it to the year 296, but Usseus reckons it amongst the events of 303 Between 4 or 500 years after St Alban's death, Offa king of the Mercians built a very large and stately monastery in his memory, and the town of St Alban in Hertfordshire takes its name from our protomartyr

**ALBANI** (Francis), an Italian painter, was born at Bologna in 1578 His first master was Denys Calvert, who left him to the instruction of his pupil Guido Ruffi in whom he accompanied to the school of the Carracci Having finished his studies at Bologna, Albani went to Rome, where he married, but on the death of his wife he returned to his native place, and again entered into the matrimonial state with a woman of the name of Dorotea, who was very beautiful She brought him several fine boys, and Albani painted pieces in which his wife and children served as models for Venus and Cupids He was fond of representing the fur sex and his compositions on love subjects are held in high esteem He died in 1660

**ALBANI** in antiquity, a college of the priests of Mars

**ALBANIA**, a province of Turkey in Europe, on the Gulph of Venice, bounded by Livadia on the S by Thessaly and Macedonia on the E and by Bosnia and Dalmatia on the N

**ALBANIA**, a country of Asia, bounded on the W by Iberia on the E by the Caspian Sea, on the N by Mount Caucasus, and on the S by Armenia and the river Cyrus, now Kur

**ALBAN ST**, a borough town of Hertfordshire, twenty one miles from London It sends two members to parliament, and has a market on Wednesday and Saturday This town rose from the ruins of the ancient city Verulam, many vestiges of which are to be seen in the neighbourhood The church of the abbey is remaining to this day and the weather have made it look like stone on the outside, but if a bit be broken off, the redness of the brick immediately appears When the monasteries were dissolved, the townsmen paid 400 pounds to prevent its being levelled with the ground and have since converted it into a parish-church, which, for its largeness, beauty, and antiquity, claims a particular regard It had a very noble font of solid brass, in which the children of the kings of Scotland were used to be baptized, and was brought from Edinburgh, by sir Philip Lea, when that city was in flames, but in the times of the late civil wars it was taken away Here

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Cæsar obtained a victory over Cassibelaun, and this was the scene of Boadicea's victory and cruelty, when she massacred 70,000 Romans and Britons who adhered to them. Near this place were fought two obstinate battles between the houses of York and Lancaster. Lat 51 44 N Lon 0 13 W

**ALBANY**, a British fortress on the S W of Hudson's Bay. Lat 52 20 N Lon 81 20 W

**ALBANY**, a town of North America the capital of one of the ten counties of the province of New York. Lat 42 56 N Lon 74 20 W

**ALBARA** (אלברא *alla'ua*, (Chald.) The leuc or white leg)

**ALBARAZAN**, a strong and large town of Arragon in Spain. Lat 40 2 N Lon 1 16 W

**ALBARI** in antiquity those who made earthen vessels with those who whitened walls were called Dibariotes

**ALBARI MOPUS** in ancient building, the incrustation or covering of roofs with white plaster

**ALBATEGNI** an Arabic prince of Bitun in Mesopotamia, was a celebrated astronomer about the year of Christ 850. He wrote 1 in Arabic a work under the title of The Science of the Stars, comprising all parts of astronomy. Editions of this were printed at Nuremberg in 1547 and at Bologna in 1645. Albategnus is highly spoken of by Dr. Helly as a very candid and unbiassed and unbiassed observationist.

**ALBATICULI**, in heraldry, horses having white manes

**ALBATROSS**, in ornithology. See **DIC-MEDIA**

**ALBET** *ad* Although notwithstanding, though it should be

**ALBEMARLE** a small town in the late province of Normandy, France, but now reckoned in the department of Lower Seine. It is on the place the Keppel found of La Hogue the title of earl. It also furnished the title of a duke to the famous general Monk. It is seated on the declivity of a hill. Lat 49 50 N Lon 1 36 E

**ALBEMARLE**, a county in Virginia between the Blue Ridge and the Indian rivers

**ALBIRAS** (*albira*, Arab.) 1 White pustules on the face 2 The herb strophilago, or strophilago whose juice was formerly used as a remedy for them

**ALBLERUO**, a kind of camel let from the Levant

**ALBFRONI** (Julius), the son of a poor gardener, in the suburbs of Placentia, born in 1664, who, by his great abilities and good fortune, rose from this low original, to the employment of first minister of state at the court of Spain and to the dignity of cardinal. He raised that kingdom out of the lethargy it had sunk into for a century past, awakened the attention and raised the astonishment of all Europe, by his projects one of which was to set the Pretender on the throne of Great Britain,

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He was at length deprived of his employment, and banished to Rome. He died in 1752, at the great age of 89. His Testament Politique, collected from his memoirs and letters, was published at Amsterdam in 1753

**ALBIRRI** (Domnico), an Italian musician, was a native of Venice. He came to London as page to the Spanish ambassador, and afterwards went to Rome, where he attained great eminence as a singer and performer. He excelled on the lute, harp, and invented a new style of playing on that instrument. In 1757, he set to music Metastasio's "Indimio" and published some other fine pieces of his composition

**ALBERTI** (Leon Battista), was descended from a noble family in Florence, and was perfectly acquainted with painting, sculpture, and architecture. He wrote on all three in Latin but his studies did not prevent him from leaving any thing considerable behind him in painting. He was employed by pope Nicholas V in his buildings, which he executed in a beautiful manner, and his work on architecture, which consists of five books, is greatly esteemed. He also wrote some treatises of morality, and a piece on arithmetic. He was born in 1398 and died in 1472

**ALBIRIUS** (Magnus), a learned dominican was born in Serbia, at the beginning of the thirteenth century. He became successively vicar general and provincial of his order, and pope Alexander IV made him master of the sacred palace. In 1260, he is preferred to the bishopric of Ratisbon which he soon afterwards resigned and retired to his cell to enjoy his study. His knowledge of nature was so great that he was accounted a magician, and several ridiculous tales are told of him. He died at Cologne in 1280. His works consisting of 11 vols. folio were printed at Lyons in 1615. He wrote upon most of the mathematical sciences

**ALBI** See **ALBIS**

**ALBICANTIA** (from *albo*, to grow white) White gland in the brain, so called from their white colour

**ALBIGENSI** a sect at about Toulouse and Albi, in Languedoc whence they derived their name, who, in the twelfth century, became remarkable for their opposition to the discipline and ceremonies of the church of Rome. The sect had their name, it is supposed, either by reason there were great numbers of them in the diocese of Albi or because they were condemned by a council held in that city. In effect, it does not appear that they were known by this name before the holding of this council. Other names given to them are Henricians, Alchirists, Bulgarians, &c., some on account of the qualities they assumed, others on that of the country from whence it is pretended they were derived, and others on account of persons of note who adopted their cause, as Peter de Brius, Arnold de Bresse, Alchard, Henry, &c. Berengar, if not Wilkliff himself, is by some ranked in the number. The Albigenes are frequently con-

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founded with the Waldenses, from whom, however, they differ in many respects, both as being prior to them in point of time, as being their origin in a different country, and as being charged with divers heresies, particularly Manicheism, from which the Waldenses are exempt. But several protestant writers have vindicated them from this imputation. Dr. Allix shews, that a great number of Manichees did spread over the western countries from Bulgaria, and settled in Italy, Languedoc, and other places, where there were also Albigenses, by which means being both under the imputation of heresy, they came either by ignorance or malice, to be confounded and called by the same common name, though in reality entirely different. See WALDENSES.

Other errors imputed to them, and their opposition, the monks of the 13th were, that they admitted the Christ of evil, who appeared on earth, the other, good, who is not yet appeared. That they denied the resurrection of the body, and maintained human souls to be damned or imprisoned in our bodies, by way of punishment for their sins. That they condemned all the sacraments of the church, rejected baptism as useless, held the eucharist in abhorrence, excluded the use of confessions and penance, maintained marriage unlawful, laughed at penitence, prayers for the dead, miracles, crucifixes, &c.—There were likewise said to be two classes of them, the Perfect and the Believers. The perfect consisted of their living in continence of both neither flesh, eggs, nor cheese. The Believers lived like other men, and were even loose in their morals, but they were persuaded they could be saved by the faith of the perfect, and that none were damned who received imputation of sins from them. But from these charges also they are generally acquitted by Protestants, who consider them as the pious invocation of the Romish church whose members were censorious by any means to blacken heretics.

The curious reader who desires to know more concerning the history of the Albigenses, may consult Petrol. Buchner's *Enquiry into the History of the Inquisition*, by C. G. G. vol. i. p. 12—70, Mosheim's *Ecclesiastical History* vol. ii. p. 580 &c.

**ALBINOS** a diseased variety of the human race, in which curious and extraordinary proceeding from one and no constitutional affection, first noticed by the Portuguese, as existing among African negroes and in which the surface of the body is rendered white, whence the distinctive name. The same morbid affection is now known to exist occasionally among other tribes. See the article **HOMO**.

**ALBINUM**, (*allus*, white) cotton weed so called from the whiteness of its blossom.

**ALBINUS**, was born at Adrumetum in Africa, and made governor of Britain, by Commodus. After the murder of Pertinax, he was elected emperor by the soldiers in Britain. Severus had also been invested with the imperial dignity by his own army, and these two

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rivals, with about 50,000 men each, came into Gaul to decide the fate of the empire. Severus was conqueror, and he ordered the head of Albinus to be cut off, and his body to be thrown into the Rhone. A. D. 198—There were others of this name of less note among the Romans.

**ALBION** son of Neptune by Amphitrite, came into Britain, where he established a kingdom, and first introduced astrology and the art of building ships. He was killed at the mouth of the Rhone, with stones thrown by Jupiter, because he opposed the passage of Hercules. The great island of Europe, now called Great Britain is called after Albion, who is said to have reigned there, or from its chalky white colour, which appears at a great distance.

**ALBION NEW**, a name given by a Francis Drake, to California.

**ALBIRIO**, in astronomy, a star in the constellation Cygnus, marked by Bayer.

**ALBIS** in ancient geography, the Elbe.

**ALBOGATIRUS** in antiquity, a white cap worn by the flamen dialis.

**ALBORAK**, in the Mithometan theology, the beast on which the prophet is said to have ridden in his extraordinary aerial journey. It is represented as of an intermediate shape and size between an ass and a mule, and many fabulous accounts are given of it by the Arabian commentators.

**ALBUCA** in botany, a genus of the class and order *Exandria monogyna*, thus characterized. Corolla petalled, the inner-ones connivent, outer-ones spreading, style tripartite. There are fourteen species, all natives of the Cape, of which some have only three and others all the stamens fertile.

**ALBUCLIM**, (*allus*, white) The herb white clover.

**ALBUGINUS OCULI** (*allus, nea* & *oculus*, from *allus* white) See **ADANATA**.

**ALBUCINFA TESTIS**, (from *allus* white) The immurmur coat of the testicles, so called on account of its white colour. It is a strong dense membrane immediately covering the body or substance of the testicle. On its outer surface it is smooth, but rough and uneven on its inner.

**ALBUGINOSUS** a (*allus*, I at) Resembling the white of an egg (*Bronn*).

**ALBUGOCULI** (from *allus* white) a white speck or opacity of the cornea.

**ALBUM**, in antiquity, a kind of white table or register, wherein the names of magistrates public transactions, &c. were entered. Of these there were various kinds.

**ALBUM**, in later times, a kind of table or pocket book presented as a mark of respect to men of letters. When Algmorn Sydney was, in Denmark, the University of Copenhagen presented him with their album, on which he wrote these words

Manus hic mimica tyrannis

Hic patet placidum sub libertate quietam

**ALBUM** is sometimes used for white lead,

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**ALBUM**, among alchemists, a tincture by which they pretended to transmute metals.

**ALBUMAZAR**, an Arabian astrologer and physician, of the ninth century. His works were printed in Latin, at Venice, in 1586, octavo. The chief of these is the *Introductio in Astronomiam*, first printed in 1499.

**ALBUMIN**, **ALBUMINA**, (from *allus*, white) 1 The white of the egg. 2 One of the radical parts of animal matter, and so called as possessing the properties of the white of the egg. The coagulable lymph, or coagulum of the blood, as also the serum consists largely of it. Its most distinguishing character is, that when exposed to heat less than half the heat of boiling water, its liquidity and transparency disappear, and it becomes opake, white, concrete, and solid. It undergoes the putrid but not the acedous fermentation. This substance is abundant in all animals, and chiefly contributes in the formation of web, membrane, cartilage, sponge, the horny shells of porcupine or corals, horn, hair, feather, quill, hoof, nail, horny scale, crustaceous and tortoise shells. Its constituent parts are carbon, hydrogen, azot, with different proportions of oxygen, phosphoric acid and muriatic acid, soda, and lime. It is conjectured by many chemists to be the basis of all animal substances, and that gelatin and fibrin only or chiefly differ from it by possessing a larger proportion of oxygen. It is occasionally traced in the juices of vegetables, and especially of the *tetradynamia* or cruciform class.

Pure albumin is a fluid of a consistence somewhat viscous, perfectly soluble in pure water at the common temperature, but when exposed to a heat above 140° of Fahrenheit's thermometer, it coagulates, and is then no longer soluble in water.

Albumin has a slight subline taste, and, by converting the blue colours of vegetables into green, indicates the presence of an alkali. It is coagulable, not only by heat, as stated above, but also by the action of acids, more

regularly the three mineral ones, and by all the metallic salts. Caustic alkalis, however, hold it in permanent solution whether it be previously liquid or coagulated.

It is coagulable also by nitrat of silver, the red oxyd of mercury, tannin, and alcohol. If it be diluted with a considerable quantity of water, it is remarkable that no coagulation is produced by any of these agents.

Much diversity of opinion has prevailed among chemists with respect to the cause of the coagulation of albumen, but as it would exceed the limits of our work to enter into the discussion, we can only state in general terms, that Scheele ascribes the coagulation to the absorption of chlorine, and Fourcroy to that of oxygen, while others suppose that no absorption takes place, but that the effect is produced by a change in the figures of the integumentary particles of the albumen. A curious discussion of this point is given in the Supplement to the *Encyclopædia Britannica*, vol II p 596.

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Coagulated albumen is dissolved by the mineral acids, greatly diluted with water, and if a concentrated acid be added to the solution, the albumen is again precipitated. Alkalies, however, do not precipitate it from its solution in acids. But if a solution of tan be poured into the acid solution of albumen, a very copious precipitate appears.

If the solution of tan be poured into an aqueous solution of liquid albumen it forms with it a very copious precipitate, which is insoluble in water. This precipitate is a combination of tan and albumen. This property furnishes us with a method of detecting the presence of albumen in any liquid in which we suspect it.

Pure alkalis and lime water also dissolve albumen, at the same time ammonia is disengaged, owing to the decomposition of part of the albumen. Acids precipitate the albumen from alkalis, but its properties are changed.

Nitric acid when assisted by heat, disengages azotic gas from albumen, but the quantity is not so great as may be obtained from fibrin. The albumen is gradually dissolved, nitrous gas is emitted, oxalic and malic acids are formed, and a thick oily matter makes its appearance on the surface. When distilled, it furnishes the same products as fibrin, only the quantity of ammonia is not so great.

The discovery of albumen in vegetables is due to Fourcroy, who first obtained it from the juice of young cucumbers. Having filtered two pounds of this juice while cold through bletting paper, he exposed it in a broad shallow vessel to the air at a temperature of about 80° Fahr. In two hours, it deposited a greenish matter, and was then exposed to the heat of boiling water, which in a few minutes separated a large quantity of white flocculent matter. Another portion of the same liquor, instead of being being exposed to the air, deposited at the end of two days a similar coagulum. On a third portion the same effect was produced by sulphuric acid. The substance thus obtained, after repeated washings in cold water exhibited all the properties of animal albumen. It was afterwards found in the leaves and roots of various other plants.

By spontaneous decomposition in the open air, albumen passes rapidly into the putrid fermentation, smells acid, becomes brown, and gives out ammonia.

Animal albumen is contained in milk, and eggs, forms a considerable part of the food of man, that also which is found in vegetables contributes largely to his support. It is much used in the arts of dressing leather and refining sugar, and the more transparent kinds are employed for varnishes. The property it possesses of coagulating by heat, renders it effectual in clarifying liquors of various kinds.

It exists most abundantly in the antiscorbutic and narcotic plants, where it generally resides in the leaves, and its existence may be easily discovered by mixing the freshly expressed juice of these plants with spirits of wine, or by

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macerating them with hot water, nearly to the boiling point—in both cases the albumen will be coagulated, and separated from the other fluids in the form of a cheesy matter

**ALBUMEN OVI** The albumen or white of the egg

**ALBUMEN** In botany a term used by Grew and Gartner, for the substance of the lobes of the seed, which corresponds with the white in an egg

**ALBURNUM** The soft white substance in trees, between the liber or inner bark and the wood, gradually acquiring solidity, and becoming genuine wood—*Intermedia substantia libri & ligni* Lin. Also the fluid that ascends through the vessels in spring time. Both are equally denominated the p

**ALBY**, a large and ancient town of France. It is now the episcopal see of the department of Fm, and contains 10,000 inhabitants. The inhabitants make a figure in ecclesiastical history, under the title of Albigenes, they were the first that disputed the title of the pope, and were condemned by a council here in 1170. The environs of Alby are very delightful. Lat 43 50 N Lon 2 14 E

**ALCA**, in ornithology. Genus thirty three, order three, or insects of the class of birds. The Auk. The following is generic character. Bill toothless, short, compressed convex often transversely furrowed, lower mandible gibbous near the base, no tail linear, legs mostly three-toed. It is chiefly an inhabitant of the arctic sea, is very stupid, and builds in rabbit burrows, and fits nests of rocks. Lays one egg. Its colour is nearly uniform, above black, beneath white, body shaped like a duck, the bill with oblique curved lines tending to a point which is sharp. Of this genus there are eleven species, of which the most worthy of remark are 1. *Alca arctica*, the puffin of which there are two varieties. It inhabits the northern seas of Europe, Asia and America, in vast flocks, feeds on small fish, crab and sea-weed, its claws inches long, flesh red, except when very young, eggs excellent, body black, cheeks, breast, and belly white, bill red, with a black base, upper eye lid with a large fleshy point, legs red. 2. *Alca in pen nis*, penguin, great auk. Inhabits Europe, and America, three feet long, is stupid, cannot fly, and feeds on fishes, e. g. six inches long, white with purplish lines and spots, bill black, with from eight to ten grooves, wings short as though mere rudiments of wings, secondary quill feathers tipped with white, legs black. (See Nat Hist pl XI.) 3. *Alca cirrata*, tufted auk. Inhabits Kamtschatka, and the adjacent island, nineteen inches long, lives on the water for days together, but never ventures far from land, feeds on shell fishes, which it opens with its bill. Bill and legs red, front, sides of the head and chin white. Female less than the male, bill with two grooves, tuft shorter, egg white. The other species are, *Alca labridora*, Labrador auk. *Alca tordan*, razor-bill. *Alca cristatella*, crested auk. *Alca tetraula*, dusky auk. *Alca pit*

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*tetula*, Perroquet auk. *Alca alba*, little auk. *Alca antiqua*; ancient auk. *Alca pygmaea*, pigmy auk.

**ALCEA ROSIA**, (αλμαρε, from αλμα, strength.) The systematic name for the *MATVA ARBorea*, which see. Thus called from its supposed restorative powers.

**ALCIBIUS** a famous ancient lyric poet, was born at Mitylene, in the island of Lesbos. He flourished in the 14th Olympiad, at the same time with Sappho, who was likewise of Mitylene. In the time of Alcibiades, Mitylene suffered under the oppression of Persians. He headed a faction party for the deliverance of his country, but in the proved unsuccessful, and was banished by Persians, who gave him his liberty, although he had been treated by him in a most abusive manner. Alcibiades was much addicted to the detestable Greek vice, the love of boys. The name of his favourite was Cleus, of whom Homer speaks, and who is probably the boy whom Cicero notes for having a mole upon his face, which in the poet's eye, was a beauty. The poetical abilities of Alcibiades are undisputed, and though his writings were chiefly both lyric strains, yet his muse was capable of treating the sublimest subjects with a suitable dignity.

**ALCEUS** an Athenian tragic poet, and is some think, the first composer of tragedies. He renounced his native country Mitylene, and passed for an Athenian. He left ten pieces, one of which was Persians, that which he produced when he disputed with Ariophanes, in the fourth year of the 97th Olympiad. There is another Alcibiades mentioned in history, perhaps the same whom Porphyrius mentions as a composer of tragic and comic tragedies, and who wrote a poem concerning the philosophy of Empedocles the historian. He lived in the 14th Olympiad. We are told likewise of one Alcibiades, a Megarian who lived in the reign of Vespasian and Titus. We know not which of these it was who suffered for his Jewishness every manner of death, which gave occasion to the following epitaph.

Αλκις παρ' οὐρανῷ, &c

The Alcibiades tomb, who died by a Jewish, the daughter of the earth, and punisher of adulterers.

Hence we may understand the menace of Cællus,

Ah! tum te miserum, malique fati,  
Quem intratus pedibus, patente porta,  
Percurrunt, ipse inique mugilesque IPIGAS

Ah! wretch had thou and born to luckless fate,  
Who art discovered by the unshut gate!  
If once, alas! the Jewish law should come,  
The Jewish, or the Jewish is thy doom.

**ALCAICIST** See ALCAICIST.

**ALCAIC ODE**, a kind of manly ode composed of several strophes, each consisting of four verses, the first two of which are always alcaics of the first kind, the third verse is a diameter hypercatalectic, or consisting of four feet and a long syllable, and the fourth verse is an alcaic of the second kind.



## ALC

**ALCAICS**, In ancient poetry, a denomination given to several kinds of verse, from Alcaeus, their inventor. The first kind consists of five feet, viz a spondee, or iambic, an iambic, a long syllable, a dactyle another dactyle. The second kind consists of two dactyles and two trochees, as, *Exilium imposui | turba | cymbis*. Besides the two, which are called dactylic alcaics, there is another styled simply alcaic, consisting of an epitrite, a choriambus, another choriambus, and a trocheus.

**ALCAID** **ALCAIDE**, or **ALCALDE**, in the polity of the Moors, Spaniards, and Portuguese, a magistrate, or officer of justice, answering nearly to the French provost and the British justice of peace.

**ALCAII**. See **ALKAII**.

**ALCANNA**, in commerce a powder prepared from the leaves of the Egyptian privet, and much used by the Turkish women to give a golden tinge to their nails and hair. In dying, it gives a yellow colour when steeped with common water, and a red one when infused in vinegar. There is also an oil extracted from the berries of alcanna, and used in medicine as a sedative.

**ALCANIARA**, a fortified town of Spanish Estremadura near the frontiers of Portugal. It was besieged and taken by the cul of Castile, and the confident Portuguese, in 1706. It is 142 miles N. by W. of Seville. Lat. 39° 20' N. Lon. 6° 7' W.

**ALCANIARA**, a mill town of Seville, in Andalusia. Lat. 37° 40' N. Lon. 10° W.

**ALCANIARA**, knights of, a military order of Spain the precise time of its institution is not known. The history of the order is confined chiefly to the expeditions against the Moors.

**ALCAUDIELE**, a beautiful town of Spain in the province of Andalusia and country of Cordova, 11 the road from Cordova to Jien, eighteen miles W. of Jien.

**ALCEDO** kingfisher. In zoology a genus of the class aves, order pisciv. Linnæus. Its generic character is the following. Bill unguis, thick, straight, long, pointed, tongue fleshy, very short, flat, pointed. Feet, in most, pressed. It chiefly frequents rivers and lives on fish, which it catches with curious dexterity, swallow its prey whole, but brings up the undigested part though short-winged, flies with great swiftness, its predominant colour blue in different shades, nostrils small and, in most covered with feathers. The alcedo contains upwards of forty species, of which the chief are, 1 A cristatus, crested kingfisher, affording two varieties. 2 A formosa, splendid kingfisher the most beautiful of the entire genus, with tail short, body yellowish-green shoulders, throat, and rump yellow wings, and crown, blue, bill yellowish horn colour, head with a bright yellowish stripe each side, including the region of the eyes, smaller wing-coverts edged with yellow, legs reddish brown. An inhabitant of South America (See Nat Hist pl II, 3

## ALC

4 *ispida*, common kingfisher 4 A *purpurea*, purple kingfisher 5 A *alcyon*, belted kingfisher of which there are four varieties 6 A *chlorocphala*, green headed kingfisher.

**ALCLERON**, (Arab.) The ricinus or castor berry.

**ALCES**, in entomology, a species of lucanus.

**ALCES**, in zoology, a species of Cetus. See **FISH**.

**ALCISTER**, or **ALNCESTER**, in ancient town of England, in the county of Warwick, situated at the union of the rivers Aln and Arrow, the principal manufacture is making needles the market is on Friday, and considerable for corn eight miles NW Stratford upon Avon, an 102 NW London.

**ALCHEMIA** **LADIES MANTLE** A genus of the class and order tetradia monogynia. Calyx eight cleft inferior every other segment smaller, corolla 5, seed one, naked. It embraces six species of which three are common to our own prairies or mountains. It was called alchemilla, because the herb is formerly much celebrated by old alchemists. One of its species, a vulgar till retains a place in some pharmacopœias, being esteemed a powerful stimulant in hemorrhages, fluor albus, and even internally.

**ALCHIMIST**, one who professes or practices alchemy.

**ALCHEMY** or **ALCHYMY**, a more refined or abstract kind of chemistry, conversant about the mysteries of the unit and assumed in the 12th centu, by the adventurous philosophers who were engaged in the making of gold, and in searching for the philosopher's stone. The term is unquestionably derived from the Arabic alky, heavenly or divine and ma, like or resembling, i. e. something god-like, heavenly, or divine. And hence the word should rather be phyl alchymy than alchemi meaning the divine science of philosophy.

From assuming too much however, the alchemists accomplished too little their ideas instead of being expanded by the grandeur of their pursuit, were concentrated about a single object, to the exclusion of every other and while the artists were supplying the wants of mankind by their useful exertions, the alchemists, with all their lofty pretensions, were constantly disappointed in their aim. In order to support their reputation, they wrote books on their boasted science, so obscurely as to impart no instruction and in the exhibition of their experiments they employed tricks and evasions to deceive their pretors.

But the term was not confined to the making of gold, and the search after the philosopher's stone, by which metals were said to be transmuted, for in the beginning of the sixteenth century, Paracelsus, a Swiss physician, who had performed many wonderful cures by chemical preparations, declared his opinion that a universal medicine might be discovered by alchymy. Filled with this notion, he un-

dertook the enquiry with all imaginable ardour, and was joined by others, who entered into his project with the most enthusiastic hopes of success. Some, whose expectations hid overpowered their judgment, actually fancied that they had made the wished for discovery, and assumed the title of Adepts, but further experience convinced them of their error, and obliged them to abandon their chimerical pursuit.

The other objects of alchymy were, a universal dissolvent, or all that which should dissolve all substance, and universal ferment, or a matter which being applied to any seed or substance shall increase its fecundity to infinity. With these and similar extravagancies were the pretenders to wisdom deluded, in the darkness of the middle ages, nor was it till the middle of the sixteenth century that the mysteries of alchymy were exposed and confuted by Kircher, the Jesuit who wrote a noble work entitled *Mundus Subterraneus* and by the learned Comenius, whose abilities were displayed with much success and reputation. By these efforts, the prevalence of alchymy was impeded and diminished, the charm by which it held its dominion over the mind was broken, and the system of blighted ignorance gave way to the light of real science. Before, "a little truth was so diluted in a large quantity of falsehood that it became invisible and inseparable to the few known properties of bodies fancy added others more dazzling, metals were supposed to sympathize with planets and with the different parts of the human body, and the greatest absurdities were revered, because they were enveloped in mysterious darkness, in which they were entrenched against the attacks of reason."—But now, when the several parts of chemical knowledge began to be collected, examined, and compared, the true path of enquiry was discovered, and by the labours of Kircher and Comenius, together with those of their successors Burner, Bohmus, Beccher, Stahl, Boerhaave and Macquer, the true foundation was established of that scientific chemistry, which has since been so much cultivated and improved, and of which a fuller account will be given under its proper article in this Dictionary. See *CHEMISTRY*.

It ought, however, to be remembered that though the pursuit of alchymy were the most preposterous that can be conceived, yet the ardour with which they were followed, the amazing number of experiments that were made, and the care that was taken to observe their results, contributed to the discovery of many facts, combinations, and properties, to which chemistry, even at this day, is highly indebted, and thus the activity of error was eventually favourable to the cause of truth.

**ALCHYMICAL** *ad* (from *alchymy*) Relating to alchymy (*Camden*).

**ALCHYMICAL** *ad* (from *alchymical*) In the manner of an alchymist.

**ALCHYMI** *s* (from *alchymy*) One who pursues or professes the science of alchymy.

**ALCHYMY** See *ALCHEMY*.

**ALCIBIADES**, an Athenian general, famous for his versatile genius, and natural foibles. He was disciple to Socrates, whose lessons and example checked, for a time, his vicious propensities. In the Peloponnesian wars he encouraged the Athenians to make an expedition against Syracuse. He was chosen general in that war, and in his absence he was accused of impiety. Upon this he fled, and stirred up the Spartans to make war against Athens, when this did not succeed, he retired to Tisaphernes, the Persian general. Being recalled by the Athenians, he obliged the Lacedæmonians to sue for peace, made several conquests in Asia, and was received in triumph at Athens. His popularity was of short duration, the failure of an expedition against Cyme exposed him again to the resentment of the people, and he fled to Pharnabazus, whom he almost induced to make war upon Lacedæmon. This was told to Lysander, the Spartan general, who prevailed upon Pharnabazus to murder Alcibiades. Two servants were sent for that purpose, and they set on fire the cottage which he was, and killed him with darts as he attempted to make his escape. He died in the 46th year of his age, 404 B. C. after a life of perpetual difficulties. His character has been cleared from the aspersions of malvolence by the writings of Thucydides.

**ALCIBIADES**, in entomology. See *PAPHILIO FÆQUES*.

**ALCMAER**, a town of the United Netherlands, in the state of Holland, situated near Schermer, one of the largest lakes of North Holland, not much above a league from the sea, with a canal into the Y, and thence to Amsterdam. The land about the town was formerly full of morasses, but being now drained, is become exceeding good meadow land eight leagues NNW Amsterdam N lat 52 28 I lon 4 26.

**ALCMAN**, a lyric poet, who flourished in the 27th Olympiad. He was born at Sparta, and composed several poems, of which only some fragments are remaining quoted by Athenæus and some other ancient writers. He was very amorous, accounted the father of gallant poetry, and is said to have been the first that introduced the custom of singing love-songs in company. He is reported to have been one of the greatest eaters of his age, upon which Mr Bayle remarks, that such a quality would have been extremely inconvenient if poetry had been at that time upon such a footing as it has been often since, not able to procure the poet bread. He died of a strange disease, for he was eaten up with lice.

**ALCMANIAN**, in the ancient poetry, a kind of lyric verse, or metre, consisting of two dactyls, and two trochees. Such e gr is

Virginibus pueri quo canto

The word is formed from Alcman, the poet. **ALCOHOL**, or **ALKOHOL**, (from an Arabian word which signifies antimony, so called from the usage of the Eastern ladies to

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paint their eyebrows with antimony, reduced to a most subtle powder, which thus came to signify any thing exalted to its highest perfection.) Ardent spirit, or what is vulgarly called spirit of wine, is, when pure, a highly rectified distillation of such liquors as have undergone the vinous fermentation, or it is the purely spirituous part of these liquors. It is the product of the saccharine principle, formed by the successive processes of vinous fermentation and distillation, and all fermented liquors will afford it. Though brandy, rum, arrack, malt-spirit, and the like, differ much in colour, taste, smell, and other properties, the spirituous part, or alcohol, is the same in each. We shall state the chief properties of this fluid, the best methods of procuring it, and the modes by which its purity may be ascertained.

The chief properties of alcohol are the following.—It is a colourless transparent liquor, appearing to the eye like pure water, very moveable, and very light, an ounce phial being capable of holding no more than six drams and forty-eight grains of alcohol. Its smell is poignant and agreeable, its taste hot and pungent. From its great lightness and mobility, the bubbles which are formed on striking it subside almost instantaneously. It is so exceedingly volatile as to be converted into a vapour by the heat of the hand, when exposed to the air, it is evaporated at the temperature of ten degrees above the freezing point, and leaves no residue except a little water when it is not quite pure, it boils at the temperature of about 105° Fahr., and the vapours when condensed run unaltered to their former state. It has never been frozen by any degree of cold produced by nature or art. Its specific gravity is about 0.825, and it is composed of carbon, hydrogen, and water.

When alcohol is heated in contact with air, it soon kindles and burns with a light flame, the middle of which is white and the edges blue, if it be pure, it burns in this manner without leaving any residue, and the flame is unaccompanied with noise or the emission of any unpleasant vapour.

Boerhaave observed that the vapour that escaped during this combustion, when collected, was found to be nothing but water. Juncker and Dr Black had made the same remark, and the latter suspected that the weight of the water exceeded that of the alcohol consumed. This conjecture was confirmed by Lavoisier, the first who analysed this substance, and who found that the water produced by the combustion of alcohol exceeded the alcohol consumed by about one seventh part.

Alcohol mixes with water in any proportion. During the mixture heat is extricated, which is sensible to the hand even in small quantities. At the same time there is a mutual penetration of parts, so that the bulk of the two liquors when mixed is less than when separate. The alcohol may be again separated from the water by distillation in a gentle heat. So strong is the affinity between these two fluids, that water is capable of separating alcohol from

many of the other bodies which may be united with it; and again, alcohol decomposes most saline solutions, and precipitates the salts.—On these accounts alcohol has been applied, and with success, to the examination of mineral waters, the salts contained in which it precipitates without alteration. See WATERS, mineral.

Alcohol is capable of dissolving a great number of substances, which renders it highly useful in various processes and in analysis. With some of the weaker acids, as the boracic and tartaric, it forms mixtures without decomposition and may be separated from them by evaporation.—With the stronger acids, it produces more powerful effects, and, in particular, with the three mineral acids, it forms sulphuric, nitric, and muriatic ether (See ETHER.) The following substances are also soluble in alcohol, in different proportions. All the alkalis, when pure, several of the neutral, earthy, and metallic salts, ammonia, both pure and carbonated, carbonic acid gas, sulphur, when reduced with it into vapour, phosphorus, slightly, most of the vegetable acids, highly sugar, readily, but the mucilage that is mixed with it, very slightly, the essential oils, and most odorous parts of vegetable, forming when distilled with alcohol, lavender water and other distilled spirits, all the resins and gum resins, forming tinctures, and resinous extracts, camphor, readily and in a great proportion, and the mineral substances, wax, permarctin, binary calculi, &c.

On the contrary, alcohol will not dissolve or unite with the following substances—the fixed alkalies when combined with carbonic acid, all the sulphates, both of the alkalies, earths, and metals, some of the nitrated metals, some of the muriated metals, metals and their oxides, and metallic acids, sulphur unless when it and the alcohol are in the state of vapour, all the pure earths, the fixed oils, unless when united with all oleo or converted into drying oil, by metallic oxides, muscular fibre, the coagululum of blood, and albumen.

*Methods of preparing alcohol.* In this country it is procured most plentifully from fermented grain liquors prepared for distillation, from grain, in France &c., but in the wine countries, it is obtained by distilling wine, whence it is called spirit of wine. M Baume gives the following directions for the separation of the alcohol.—“Put a quantity of brandy in the water bath of an alembic, and proceed to distillation. Set apart the first product of the distillation when it amounts to about a fourth part of the liquor put into the alembic. Then continue the process till about as much more is obtained, or till the liquor comes over white and milky. Then redistil the latter product, and mix the first half which comes over with the first part of the former distillation, and continue to distil as long as any spirit comes over. This latter portion may be again distilled, and the first product mixed with the former first products, as before. After each distillation, there remains in the alembic a watery liquor

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which retains the smell of brandy, but is entirely deprived of inflammable spirit, and is thrown away as useless.

"Having thus procured all the spirit from the brandy, return all the reserved first products to the alembic, and distil with a gentle fire. When about half the liquor has come over, it should be kept apart as pure rectified alcohol, the remainder is to be distilled as long as it is inflammable, and may either be again rectified, or reserved for those purposes where a spirit of inferior strength is required.

Rouelle directs to extract, by distillation on the water bath, one half of the brandy made use of, this first product is common alcohol. By rectifying it twice, and reducing it about two thirds of its original quantity, the strongest alcohol is obtained; this, according to Kunkel, is to be again distilled with water, to separate the oil which is combined with it, after which it is perfectly pure. The residue of the brandy is nothing but water impregnated with fine particles of colouring matter, with a peculiar oil floating on its surface.

Another method is as follows—As the liquors from which alcohol is obtained generally contain it mixed with water and with a small quantity of a peculiar oil, the difficulty of making it pure consists in separating it from these substances. The alcohol may be freed from water by putting into the liquor (whether it be wine, or beer, or impure spirit), a quantity of well-dried potash, which will unite with the water, while the alcohol, mixed with a little of the potash, will swim at the top. This last is to be poured into another vessel and the operation repeated, till the potash is observed to be no longer very moist. Such spirit of wine is exceedingly strong, but rendered a little impure by the potash, and appears from its yellow colour. It must therefore be distilled to a fifth part over a slow heat, the four fifths that come over is pure alcohol.—Previous to distillation, it will be proper, in many cases, to add a little chalk, crumb of bread, lime, or other substance to remove the oil with which the alcohol is united.

To ascertain the purity of alcohol, various methods have been devised. It has been thought that the alcohol which burns readily and leaves no residue is very pure, but this test is not to be depended upon, for the heat produced is sufficiently strong to dry up a part of the water, or dissipate the phlegm it may contain, if the alcohol, however, be very weak and watery, it will not kindle at all. Another method is to drop a small quantity of spirit on unpowdered and kindle it. The spirit burns quietly on the surface of the powder till it is all consumed, and the last portion of it, if pure, sets fire to the powder, but if the spirit be watery, the powder becomes damp, and will not explode. This proof, also, is fallacious, for if any considerable quantity, even of the best alcohol, is poured on a little powder, the water which it affords as it burns moistens the powder, and prevents it from kindling, and if it be only barely moistened, any spirit that will burn

will inflame it. Boerhaave employed dry powdered potash, which he cast into the alcohol under examination, and if it contained a superabundance of water, the alkali would unite with the water, and sink to the bottom. But the most accurate method is to find its specific gravity by means of an instrument contrived by Baume, called an *Areometer*, and compare it with the density of known quantities of alcohol and water previously mixed for the purpose.

The uses of alcohol are very numerous and extensive. In addition to those mentioned above which relate to various instances of chemical analysis, to the examination of mineral waters, and of many animal and vegetable substances it is subservient to a number of useful purposes in the arts and in medicine.

It is employed largely in combination with copal resin, oil of spike, oil of turpentine, &c. to form varnishes. From its muscular power, it is well calculated to preserve bodies in anatomical preparations. Its gentle and steady heat, unaccompanied with smoke, renders it eligible for burning in lamps, and the impossibility of freezing it in any known degree of cold, shows it to be well adapted for indicating the lower degrees of temperature in the thermometer. Distilled spirituous waters are formed by a combination of alcohol with the aroma of plants.

Alcohol, either pure or mixed with camphor, is used to stop by external application the progress of gangrenes. Distilled spirituous waters are often administered as tonics, cordials, antispasmodics, stomachics, &c. either diluted in water, or sweetened with syrups. Liniments, which are a solution of the more active parts of vegetable in alcohol, possess nearly the same qualities, but they act with more energy.

The vapour of alcohol, transmitted through a rubber tube, forms the singular air, called *OLÉFACANT GAS*, which see.

*ALCOPOI* is also used for a very fine impalpable powder, which women in the east make use of as a kind of *lucus*. *Kohol* is a general term denoting a substance applied to the eyelid on the inside of the eyelids, in the form of a powder finely levigated. That which is employed for ornament and is principally antimony, is called simply alcohol or *isphahau*, when other ingredients are added, on account of some particular disorders, the *kohol* is distinguished by some appropriate epithet. The ladies of Barbary trace their hair, and the edges of their eyelids with alcohol, the powder of lead ore. The *kohol* is also used by the men for strengthening the sight and preventing disorders of the eye, for which purpose different ingredients are occasionally added. It is also applied to the eyes of children as soon as they are born, and continued at intervals of a few days, until they arrive at maturity. The use of the *kohol* is very ancient, and various parts of sacred history are supposed to refer to it. Gen. xlix. 12. and Lowth on Isaiah, note to chap. iii. v. 16.

*ALCOHOL MARTIS*, filings of steel reduced

## A L C

to an impalpable powder, by turning into rust with urine, levigating, washing, and drying it it was formerly used as a remedy in the gout.

**ALCOHOLIZATION**, the rectification of a vituous spirit. It is otherwise called alcoholization; and is sometimes used for pulverization.

**ALCOLA**, among alchemists, the tincture of urine, is found in three different forms, 1 Resolved, or reduced into an impalpable substance, 2 Sandy, 3 Mucilaginous, or viscous.

**ALCOR**, the Arabian name for the small star very near alioth in west major. The Arabians apply a proverb to those who pretend to see small things while they overlook much greater — I thou canst see alcor, and yet not see the full moon.

**ALCORAN**, or **AI-KORAN**, the scripture, or bible of the Mahometans. The word is compounded of the Arabic al, meaning my, and Kor, a particle signifying corn or horn, derived from the verb karra or karra, to read and my hence men either 'God's book' or 'the book of God, or emphatically 'the book' the first is the best interpretation. The Alkoran is divided into 114 different portions of very unequal length, which we call chapters, but the Arabians sowar. The chapters are not, in the manuscript copies, distinguished by their numerical order, but by particular titles, which are taken sometimes from a particular matter treated of, or person mentioned therein, and some chapters have two or more titles, occasioned by the difference of the copies. Every chapter is subdivided into smaller portions of very unequal length, with us called verses, but in Arabic ayat the same with the Hebrew othoth, signifying sign or wonders, such as are the secrets of God, his attributes, &c. Many of these have their particular titles also.

Besides these unequal divisions of chapter and verse, the Mahometans have also divided their Alkoran into 60 equal portions, which they call Ahzab, in the singular Hizb, each subdivided into four equal parts, which is an imitation of the Jews who have in ancient divisions of their Mishna into 60 portions called Maseoth.

Next after the title, at the head of every chapter, except only the 9th, is prefixed the following solemn form by the Mahometans called the Bismallah. In the name of the most merciful God, which forms the constantly place at the beginning of all the books and writings in general, as a peculiar mark or distinguishing characteristic of their religion, it being counted a sort of impurity to omit it. Mahomet probably took it from, as he did many other things, from the Psalms of David, who used to begin their books in these words, Bismen Ya'ezan hakshashigheh didar, that is, In the name of the most merciful just God — There are 29 chapters of the Alkoran, which have this peculiarity, that they begin with certain letters of the alphabet, some with a single one, others with more. These letters the Mahometans believe to be the peculiar marks of the Alkoran, and to conceal several pro-

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found mysteries, but they have been explained by writers in many different ways.

The Alkoian is universally allowed to be written with the utmost elegance and purity of language, and is confessedly the standard of the Arabic tongue. Indeed the more orthodox believe, and are taught by the book itself to consider it immutable by any human pen, a permanent miracle, greater than that of raising the dead, and alone sufficient to convince the world of its divine original. To this miracle, in fact, did Mahomet himself chiefly appeal for the confirmation of his mission, publicly challenging the most learned men in Arabia to produce even a single chapter that might be compared with it.

The general design of the Alkoran was to unite the professors of the three different religions, then followed in the populous country of Arabia, in the knowledge and worship of one God, under the sanction of certain laws, and the outward signs of ceremonies partly of ancient and partly of novel institution enforced by the constitution of rewards and punishments both temporal and eternal, and to bring them all to the obedience of Mahomet, as the prophet and messenger of the deity.

The real design of the Alkoran is the glory of God, to which point Mahomet pretended was the chief end of his mission, it being laid down by him as a fundamental truth, that he never was, nor ever can be more than one true orthodox religion. Whenever this idea became neglected or corrupted in certain God he is cited, had the goodness to reform and re-administer him and there of, by several prophets, of whom Moses and Jesus were the most distinguished, till the appearance of Mahomet, who is their seal and no other to be expected after him. It more effectually to enforce this idea, great part of the Alkoran is employed in relating examples of decided punishment, severely inflicted by God on those who rejected or abused his messengers, several of which stories, or some circumstances of them, are taken from the Old and New Testaments, but many more from the apocryphal books and traditions of the Jews and Christians of those ages. Indeed, few or none of the relations or circumstances in the Alkoran were invented by Mahomet, as is generally supposed, it being easy to trace the greatest part of them much higher, as the rest might be, were more of those books extant, and were it worth while to make the enquiry.

The rest of the Alkoran is taken up in prescribing necessary law and duties, frequent admonitions to moral and divine virtues, the worship and reverence of the Supreme Being, and resignation to his will. One of the most learned commentators distinguishes the contents of the Alkoran into all, moral and legal, under the former are comprehended all the obscure, parabolical, and enigmatical passages, with such as are repeated, or abridged, the latter, such as are clear, and in full force.

The most excellent moral in the whole Alkoran is that in the 23rd chapter, which is the 23rd chapter.

Al Araf, viz. shew mercy, do good to all, and dispute not with the ignorant. Mahomet, according to the authors of the Keshaf, having begged of the angel Gabriel a more ample explanation of this passage, received it in these terms: "Seek him who turns thee out, give to him who takes from thee, pardon him who injures thee, for God will have you plant in your soul the roots of his chief perfections." It is evident, this commentary is copied from the gospel. But it matters not so much who had it first, as he who observes it best. The caliph Hassan, son of Hali, being at table, a slave unfortunately let fall a dish of meat recking hot, which scalded him severely. The slave fell on his knees, rehearsing these words of the Alcoran, "Paradise is for those who restrain their anger." I am not angry with thee, answered the caliph—"And for those who forgive offence against them," continues the slave. I forgive thee thine, replies the caliph—"But above all, for those who return good for evil, alas the slave! set thee at liberty, rejoined the caliph, and I give thee ten dinars."

It is beyond dispute that Mahomet was really the chief contriver of the alcoran, though it is probable, that he had assistance in his design from others, particularly from one Sergius, a Nestorian monk, and a Jew named Abdallah ben Salim. The Mahometans, however, deny that the alcoran was composed either by their prophet himself, or any other person, it being their orthodox belief, that it is not only of divine original, but even eternal and uncreated, remaining, as some of them express it, in the very essence of God, that the first transcript has been from everlasting by God's throne, written on a table of vast bigness, that a copy from this table, in one volume on paper, was, by the ministry of the angel Gabriel, sent down to the lowest heaven in the month of Ramadan, whence Gabriel revealed it by parcels, some at Mecca, and some at Medina, at different times during the space of twenty years, as the exigency of affairs required, giving Mahomet, however, the satisfaction of seeing the whole once written. They add, that this original copy was bound in silk adorned with gold and precious stones of Paradise.

ALCORANISTS, among Mahometans, those who adhere strictly to the letter or text of the alcoran, from an opinion of its ultimate sufficiency and perfection. The Persians are generally alcoranists, as admitting the alcoran alone for their rule of faith. The Turks, Tartars, Arabs, &c. besides the alcoran, admit a multitude of traditions.

ALCAOVE (*alcova*, Span) A recess, or part of a chamber, separated by an estade, in which is placed a bed of state (*The oval*). This word is also used for an enclosed garden seat.

ALCUINUS (Flaccus,) an ecclesiastic of the eighth century. Where he was born, is a matter of dispute, but, according to the most probable opinion, it was in Yorkshire. It is pretty certain, however, that he was educated first under Bede, and afterwards by Egbert

archbishop of York, by whom he was made keeper of the library of that city. He thence rose to be deacon of the church, and afterwards became abbot of Canterbury. In the year 793 he went over to France, upon the invitation of Charlemagne, by whom he was greatly caressed, and amply provided for. He was not only honoured with his friendship and confidence, but became his instructor in rhetoric, logic, mathematics, and divinity. He attended him to the council of Francfort, and, at his return, was presented with the abbey of Fer-rara, St Jodocus, and St Lupus. He retired at last to the abbey of St Martin at Tours, where he spent the latter part of his life, and died in the year 804. Doubtless, he was one of the best scholars and wisest men of his time. France was chiefly indebted to him for her improvements in literature. The universities of Paris, Tours, Poitiers, Soissons, and many others, owe to him their origin and increase, and to him was owing the institution of learned academies, at least the first one which of us was set on foot by the emperor at his instigation. His works were collected and published by Andrew du Chesne in one volume folio, Paris, 1617. They consist of, 1 Tracts upon scripture. 2 Tracts upon doctrine, discipline, and morality. 3 Historical treatises, letters, and poems. Since this edition, there has been published an incredible number of tracts, poems, &c. ascribed to this author, most of which in all probability, were not his.

ALCYON, in entomology, a species of the papilio nymphalis.

ALCYONIUM In zoology, a genus of the class vermes, order zoophyta of Linnæus, and is thus characterised, an animal substance generally growing in the form of a plant, stem fixed, fleshy, gelatinous, spongy, or coriaceous, beset with polypæ-bearing stultic cells. Its known species are twenty-eight, of which the following are chiefly entitled to notice.—1 A arborescens. Arborescens elevatum stem arborescent, with obtuse branches and papillary pores. It is through these pores it imbibes its nutriment. It inhabits the Indian and North seas, and grows to six or seven feet in height. Flesh thick, rosy, with tubercles unequally disposed, within more yellow, with a whitish harder substance resembling the bony part of a Gorgonia, branches very jagged and irregular.

—2 A digitatum. Dead man's hand without stem, oblong, lobed, of a coriaceous wrinkled substance, covered with minute papillæ. It is an inhabitant of the coasts of Europe; adheres to stones and shells of a pale reddish grey without, whitish within, and covered with stellate papillæ protruding to polypes with eight claws.—3 A Bursa Sea-purse.—4 A Picus Sea-sig.—5 A Gelutinosus, Pudding-weed.

ALCYONIUM STAGNUM, (anc. geog.), a lake in the territory of Corinth, whose depth was unfathomable, and in vain attempted to be discovered by Nero, through this lake Bacchus is said to have descended to hell, to bring back Semele (Pausanias).

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**ALCYONIUS** (Peter,) a learned Italian, who flourished in the sixteenth century. He was well versed in the Greek and Latin tongues, and wrote some pieces of eloquence, which met with great approbation. He was corrector of the press a considerable time for Aldus Manutius, and is entitled to a share in the praises given to the editions of that learned printer. He published a treatise concerning banishment.

**ALDBOROUGH**, a borough and seaport in Suffolk, with a market on Wednesday and Saturday. It is pleasantly seated in a dale between a high hill and the sea. The harbour is small, and the sea has, some years back, made great encroachments. This town sends two members to parliament. Lat 52 16 N Lon 1 42 E

**ALDBOROUGH**, is also the name of a borough town in Yorkshire, sending two members to parliament. Lat 54 8 N Lon 1 12 W

**ALDEBARAN**, in astronomy, a star of the first magnitude, often called the Bull's eye, and is marked by Bayer as  $\alpha$  in Taurus.

**ALDER** In botany. See *BF RULA*

**ALDER**, black, or berry-bearing. See *RHAMNUS*

**ALDI RAIMIN**, in astronomy, a star of the third magnitude, marked  $\alpha$  in the right shoulder of Cepheus.

**ALDERHOLM**, an island of Sweden, at the mouth of the river Gessle, in the gulf of Bothnia.

**ALDERLIEVEST** *a* Most beloved (*Shakespeare*).

**ALDERMAN**, among our ancient Saxon ancestors, was the second of the three orders, or degrees, of nobility. The word, in its original, is *ealdorman*, compounded of *ald*, old; or *eolder*, elder, and *man*, *q d* Elder-man. Atheling was the first rank of nobility, *ealdorman* the second, and thence the lowest.

**ALDERMAN**, in the British policy, a magistrate subordinate to the mayor of a city or town-corporate. The number of these magistrates varies according to the magnitude or custom of the place. London has twenty-six, each having the care of one of the wards of the city. All the aldermen are justices of the peace for a quarter of 15 Geo II. The aldermen of London, &c are exempted from serving inferior offices, nor shall they be put upon juries, or serve on juries so long as they continue to be aldermen. An alderman ought to be an inhabitant of the place, and resident where he is chosen; if he remove he is incapable of doing his duty in the government of the place, and may be disfranchised.

**ALDERMANLY**, *ad*. (from *alderman*.) Like an alderman (*Swift*).

**ALDERN** *a* (from *alder*.) Mass of alder (*Johnson*).

**ALDERNEY**, an island in the British Channel, subject to Great Britain. It is about a mile from Capel, and thirty leagues from the coast of Normandy. It is called the *Norman*.

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is a very dangerous passage, by reason of the rocks under water. It is a healthy island, and its pasture and corn are good. The inhabitants are poor, principally occasioned by the prevailing custom of gravel-kind, by which the lands are equally divided into parcels among the tenant proprietor's children. Lat 49 50 N Lon 2 17 W

**ALDHAFRA**, in astronomy, a star of the third magnitude, being  $\gamma$  in Leo.

**ALDHELM**, or **ADELHM** (St.), an English divine, was bishop of Shureburn in the time of the Saxon heptarchy. William of Malmesbury says, that he was the son of Kenred, or Kenric, brother of Ina king of the West Saxons. He was born at Caer Bladon, now Malmesbury, in Wiltshire. He had part of his education abroad in France and Italy, and part at home under Mildulphus an Irish Scot, who had built a little monastery where Malmesbury now stands. Upon the death of Mildulphus, Aldhelm, by the hc of Eleutherus bishop of Winchester, built a stately monastery there, and was himself the first abbot thereof. When Hedda bishop of the West Saxons died, the kingdom was divided into two dioceses, viz Winchester and Shureburn, and King Ina promoted Aldhelm to the latter, comprehending Dorsetshire, Wiltshire, Devonshire, and Cornwall. He was consecrated at Rome by pope Sergius I. and Godwin tells us that he had the courage to reprove his holiness for having a bastard. Aldhelm, by the directions of a diocesan synod, wrote a book against the mistake of the Britons concerning the celebration of Easter, which brought over many of them to the catholic usage in that point. He likewise wrote a piece, partly in prose and partly in hexameter verse, in praise of virginity, dedicated to Ethelburg abbess of Barking, and published amongst Bede's *Opuscula*, besides several other treatises, which are mentioned by Bale and William of Malmesbury. He is said to have been the first Englishman who ever wrote in Latin, and as he himself tells us in one of his treatises on metrics, the first who introduced poetry into England. The character of Aldhelm is thus depicted by an ancient chronicler. "He was an excellent harper, a most elegant Saxon and Latin poet, a 'doctor egregius,' and admirably versed in the Scriptures and liberal sciences." Indeed, Alfred the Great declared that Aldhelm was the best of all the Saxon poets, and that a favourite song which was universally sung in his time, nearly 200 years after the author's death, was of his composition. Aldhelm lived in great esteem till his death, which happened May the 25th, 709.

**ALDI**, in antiquity, servants who attended their masters to the wars.

**ALDRICH** (Henry), was the son of Henry Aldrich, of Westminster, where he was born in 1647. He was educated at Westminster, from whence he went to Christ church, Oxford, in 1669. He was elected student of that college, and, in 1699, took the degree of M.A. At the revolution he was made dean of Christ church. He was one of the persons entrusted



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with the publication of Lord Clarendon's history. Besides his literary acquirements, he had a great knowledge of architecture and music, as appears by Peckwater-square, in Oxford, the chapel of Trinity-college, and the church of All-Saints, which was designed by him, and the numerous church services and anthems which he composed. The dean was also the composer of two catches, the famous one called "Hark the bonny Christ Church Bells," and the other "A smoking Catch," being himself a great smoker. He held with his decency the rectory of Wem, in Shropshire, and in the convocation of 1702, he sat as prolocutor. He died at Christ-church, December 14, 1710. Besides the works already mentioned, he printed "Arts Logice Compendium," and the Elements of Architecture, in Latin.

**ALDROVANDA** In botany, a genus of the class and order pentandria, pentagynia. Its calyx is five parted, petals five, capsule five-valved, one-celled, ten-seeded. The only known species is indigenous both to Italy and India, bladdered like utricularia, but in bunches.

**ALDROVANDUS** (Ulysses), professor of philosophy and physic at Bologna, the place of his nativity, was a most curious enquirer into natural history, and travelled into the most distant countries on purpose to inform himself of their natural productions. He was at great expence in having figures drawn from the life. Aubert le Mire says, that he gave a certain painter, famous in that art, a yearly salary of two hundred crowns, for thirty years and upwards, and that he employed at his own expence Lorenzo Bennini and Cornelius Swintus, as well as the famous engraver Christopher Cornolanus. These expences ruined his fortune, and at length reduced him to the utmost necessity, and it is said that he died blind in a hospital at Bologna, at a great age, in 1605.

Mr. Bayle observes, that antiquity does not furnish us with an instance of a design so extensive and so laborious as that of Aldrovandus, with regard to natural history, that Pliny indeed has treated of more subjects, but only touches them lightly, whereas Aldrovandus has collected all he could meet with. His compilation, or what at least was compiled upon his plan, consists of several volumes in folio, some of which were printed after his death. He himself published his Ornithology, or History of Birds, in three folio volumes, in 1609, and his seven books of Insects, which make another volume of the same size. The volume of Serpents, three of Quadrupeds, one of Fishes, that of exsangueous Animals, the History of Monsters, with the supplement to that of Animals, the treatise of Metals, and the Dendrology or History of Trees, were published at several times after his death, by the care of different persons.

**ALE**, a fermented liquor obtained from an infusion of malt, differing from beer chiefly in having a less proportion of hops. See BREWING.

This liquor is the natural substitute of wine in such countries as could not produce the

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grape, was originally made in Egypt. The natives of Spain also, the inhabitants of France, and the aborigines of Britain, all used an infusion of barley for their ordinary liquor, and it was called by the various names of *celia* and *ceria* in the first country, *cervisia* in the second, and *curmi* in the last, all literally importing only the strong water.

The method in which the ancient Britons, and other Celtic nations, made their ale, is thus described by Isidorus and Oronius. "The grain is steeped in water and made to germinate by which its spirits are excited and set at liberty, it is then dried and ground, after which it is infused in a certain quantity of water, which being fermented, becomes a pleasant, warming, strengthening, and intoxicating liquor."

The consumption of ale in these kingdoms is incredible. It was computed thirty years ago at the value of 4,000,000 pounds yearly, including Great Britain and Ireland. The duties on ale and beer make a principal branch of the revenue in Britain. They were first imposed by the 12th of Car. II. and have been continued by several subsequent acts of parliament to first Geo. III. which lays an additional duty of 3d per barrel. In the whole, the brewer of ale and beer for sale shall pay 8s. for every barrel of either, above 6s a barrel, and for every barrel of 6s or under, the sum of 1s 4d. Additional duties were laid on in 1803.

**ALE-HOUSES** must be licensed by justices of the peace, who take recognizances of the persons licensed, and of their sureties, viz. 10l each, that they will not suffer unlawful gaming, or other disorderly practices in their houses. Every person, excepting those who sell ale in fairs, neglecting to procure a licence, is liable to a penalty of 40s for the first offence, 4l for the second, and 6l for the third, with all costs. The licence is granted on the first of September, or within 20 days after, at a general meeting of the justices for the division to which he belongs, upon his producing a certificate to his character, unless, by living in a city or town corporate, this last circumstance is dispensed with, and continues in force for one year only. Ale house keepers, selling ale in short measure, are liable to a penalty not exceeding 40s and not less than 10s. and likewise to a fine of 10s for permitting tippingpling, &c.

**ALE-MEASURE** See MEASURE.

**ALEA**, in Roman antiquity, signifies, in general, games of chance. The place where these games were played was called *Alae-torium*.

**ALEANDER** (Jerome), cardinal and archbishop of Brindisi, was born in 1480, and distinguished himself at the beginning of the Reformation, by the opposition he made to Luther for being sent into Germany as the pope's nuncio in 1519, he acted, as occasion served, in the character both of ambassador and doctor, and defeated three hosts together against Luther's doctrine before the diet



of Worms, but could not prevent that celebrated reformer from being heard in that diet. He published several works, and died at Rome in 1542.

**ALEBERRY** *s* (from *ale* and *berry*) A beverage made by boiling ale with spirits and sugar, and sops of bread (*Beauumont*)

**ALFBRIWIR** *s* (from *ale* and *traver*) One that professes to brew ale (*Morltimer*)

**ALECONNER** *s* (from *ale* and *con*) An officer in the city of London, whose business is to inspect the measures of public houses

**ALF COST** See **TANACTUM**

**ALFCTOROMANTIA** (from *αλκ-α-ρ*, a cock, and *μαντια*, divination) An ancient kind of divination by means of a cock, called also *Alectryomancy*, of which there appear to have been different species. But that most spoken of by authors was in the following manner. A circle being described on the ground, and divided into twenty-four equal portions, in each of these spaces was written one of the letters of the alphabet, and on each of the letters was laid a grain of wheat, after which, a cock being turned loose in the circle, particular notice was taken of the gruns picked up by the cock, because the letters under them, being formed into a word, made the answer desired. It was thus, according to Zonar is, that Libanius and Jamblicus sought who should succeed the emperor Valens, and the cock eating the gruns answering to the space *ΘΕΟΔ*, several whose names began with those letters, as Theodotus, Theodatus, Theodulus, &c. were put to death, which did not hinder, but promote, Theodosius to the succession. But the story, however current, is but ill supported. It has been called in question by some, and refuted by others, from the silence of Marcellinus, Socrates, and other historians of that time.

**ALFCTRA** In botany, a genus of the class and order didynamia angiosperma. Calyx two-lipped, the upper lip cleft, lower three cleft, corol funnel-form, filaments bearded, capsule two-celled, double, seeds solitary. The only known species is a native of the Cape, with spiked yellow flowers streaked with purple.

**ALFGAR** *s* (from *ale* and *algie*, II) Sour ale

**ALI-HOOF**, in Botmy See **GIECHROVA**

**ALEMANNIA**, or **ALEMANIA**, ancient geography, a name given to Germany, which was not known before the time of the Auto-munes, and then the name applied only to a part of it.

**ALFMBERT** (John le Rond *d*), an eminent French philosopher, was born at Paris in 1717. He derived the name of John le Rond from that of the church near which, after his birth, he was exposed as a foundling. He received his first education in the college of the Jansenists, and then at the college of the Oratorians, and finally at the college of the Sorbonne, where he spent the remainder of his life. He was a man of extraordinary talents, and his exertions were confined to the promotion of science in general. He ranged much farther, and it is to be lamented that he did it. It is doubly to be regretted that the admiration which will ever be excited by genius and

space of 40 years, with the greatest simplicity, discovering the augmentation of his means only by increasing displays of his benevolence concealing his growing reputation and celebrity from these honest people, and making their plain and uncouth manners the subject of good-natured pleasantry and philosophical observation. His good sense perceived his ardent activity, and he had him mentioned as the writer of many books, but never took it into her head that he was a great man, and rather beheld him with a kind of compassion. "You will never," said she to him one day, "be any thing but a philosopher—and what is a philosopher?—a fool, who toils and plagues himself during his life, that people may talk of him when he is no more." In 1741, he was elected into the academy of sciences, and two years after published his treatise on dynamics. In 1746, the prize medal was decreed to him by the academy at Berlin, for a discourse on the theory of winds. In 1749, he solved the problem of the precession of the equinoxes, ascertained its quantity, and explained the rotation of the terrestrial axis. In 1752 he published an essay on the resistance of fluids, and soon after he obtained a pension from the king, through the good offices of count d'Argenson. He next engaged with Diderot in compiling the celebrated *Encyclopédie*, for which he wrote the preliminary discourse. While engaged on mathematical subjects his name was not much known, but now he became celebrated by works of an historical and miscellaneous nature, such as his "Philosophical, Historical, and Philological Miscellanees," "The Memoirs of Christina, Queen of Sweden," and his "Elements of Philosophy." The king of Prussia offered him a situation at his court, and the office of president of his academy, and the empress of Russia courted him into her dominions as tutor to the grand duke, but d'Alembert refused both these offers. In the year 1766, he published his dissertation on the destruction of the Jesuits, which brought upon him a host of enemies. He also published nine volumes of memoirs and miscellaneous pieces, entitled, *Opuscules*, and the *Elements of Music*. In 1772 he was elected secretary to the French academy, and set himself about writing the lives of the deceased academicians, of which he composed seventy. He died October 20, 1783, aged 66 years.

The talents of D'Alembert as a mathematician and natural philosopher, are universally admitted. His scientific works exhibit a singular combination of genius, judgment, and literary taste, he traversed almost every department of science with nearly unrivalled success, and added much to the general stock of knowledge, by communicating to the world the result of his profound researches. But the versatility of his talents would not admit of his exertions being confined to the promotion of science in general. He ranged much farther, and it is to be lamented that he did it. It is doubly to be regretted that the admiration which will ever be excited by genius and

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acquirements such as those of D'Alembert, must be shilled by the reflection that they ~~are~~ too frequently prostituted by endeavouring to disseminate the comfortless and restless principles of infidelity principles which, under a fair garb of philanthropy and good-will, tend ultimately, if not directly, to rob the fair face of nature of the impression of Deity, to untwist the bonds of society, and to convert mankind into a den of despairing mortals, or perhaps a horde of assassins.

For an entire list of the writings of this extraordinary man, we refer to Dr Hutton's *Maths.* and *Phil Dict* vol 1 p 62.

### ALEMBOIC (from the Arabic *alenbyc*)

One of the simplest and most ancient vessels employed in distillation. It is not at present much used in England, the rectort and still having been adopted in its stead, but in France and many parts of the continent, it continues to be the favourite vessel for distillations in the large way. The most frequent use of alembics is for distillations of very volatile principles drawn from several substances, particularly from vegetables. When the principles intended to be procured by distillation are such as do not act upon metals, and when they will rise with a degree of heat equal to, or very little exceeding, the heat of boiling water, copper alembics are employed, having their internal surfaces well tinned, but when acid and saline substances, which attack metals, are to be distilled, it is necessary to make use of glass alembics. There are several parts belonging to most alembics, as well as several kinds of alembics, differing from each other in form and substance, all which may be understood from the following description, and references to Pl 11.

**Fig 1 A glass Alembic.** A, the cucurbit, so called from the resemblance of their original form to a gourd or bladder; this part contains the matters to be distilled, or else water in which is immersed another smaller vessel of the same form, to contain the matters for distillation in a water bath; B, the head, or capital, in the shape of a hollow cone which is furnished with a gutter or channel C, placed along its inner and lower circumference; D, the beak, which opens inwardly into the gutter; it ought to be from 12 to 18 inches long, and so inclined as to make with the neck of the alembic an angle of about 60 degrees.

**Fig 2 A long neck glass Alembic.** A, the body of the matrix, the use of which is the same as that of the cucurbit above, viz to contain the matters to be distilled; B the neck of the matrix, C the head of the alembic, with its gutter and beak. The construction of this alembic is very intelligible, as the distance between the body and the capital is so great, that much of the heat must be lost before the vapour arrived at this part to be condensed, but this was one of the ill contrivances of the alchemists, who thought that the greater the distance was through which the vapour passed, the more perfectly would it be rectified.

**Fig 3 A glass Alembic consisting of one piece.** A, the cucurbit, B the head; C the aperture in the head, D its stopple, E the

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mouth of the cucurbit. Though this construction has some advantages, it has one great inconvenience, viz the difficulty of introducing and extracting solid matters.

**Fig 4 A copper Alembic.** A the body or cucurbit, B the neck, C the head, D the beak or spout, F the refrigeratory or cooler, containing cold water for the purpose of condensing the vapour as it rises into the capital C, from whence it passes through D into the receiver; the water in the refrigeratory must be renewed as often as is necessary, F a cock to let off the water from the refrigeratory, G the receiver to contain the product of distillation.

**Fig 5 A metallic Alembic, as improved by Baumé and Chapuis.** The different parts of this, and the nature of its construction, may be more easily understood by referring also to Fig 6. A the boiler, a hollow cylinder of tinned copper, of equal diameter at top and bottom but bulging out into a shoulder at g, by which it is suspended over the furnace (Fig 6), in this part are two handles a u, and a short pipe f, fitted with a cork, and used for supplying water, &c. B a cucurbit, or balmum maris, made of tin, with two handles, and a collar on the outside to support it when fitted into the inner groove b of the boiler, C a section of the capital, at the bottom of which is a collar s, by which it is fixed on the inner groove h of the cucurbit B, k is the proper capital, made of tin, with two handles, and a circular channel t, a little inclined towards the beak m, o is the refrigeratory made of copper, and surrounded by the capital, at the bottom of it is a stop-cock p. When a little boiling heat is required, the liquor is put into the boiler, and the cucurbit omitted, but when the heat is required to be more moderate and uniform, the substance to be distilled is put into the cucurbit, and the boiler is furnished with as much water as will reach to the cucurbit, and thus transmit the heat regularly.

The chief difference between an alembic and a still is in the construction of the head or capital, which in the alembic is designed not merely to collect, but to condense the vapour, whereas the head of a still serves merely to collect the vapour which is transmitted in an elastic state through the beak, and is condensed in the worm. Most of the French brandies are prepared in alembics, but all British spirits in stills. The advantage of the former are, that it requires less fuel, and is not likely to render the spirit empyreumatic, those of the latter consist in being more expeditious, in requiring less accuracy in the temperature of the cooler, and less water for the condensation of a given quantity of vapour. For a further account of the process of DISTILLATION, see that word, and also the article STILL, in this Dictionary.

**ALEMBROTH** in the writings of alchemists, a word used for a sort of fixed alkaline salt, which had the power of the famous alkali in dissolving bodies, and opening the pores of all known substances. The general idea which the word appears to convey, is that of

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a flux or solvent, either to assist in the fusion of metallic ores or earths, or to dissolve obstructions, and attenuate viscid humours in the human body, when employed medically. The term is used by chemists to denote a compound of corrosive mercury and sal ammoniac, it is then called

**ALEMBROTH SALT**, and is generally the form in which corrosive sublimate is administered internally in diseases which require the use of this active medicine. Its properties will be given under the term **MURIATE OF MERCURY**.

**ALEUTIC** *ad* (from *a* for *at*, and *leuth*.) At full length, along

**ALENTEJO**, a province of Portugal, situated between the rivers Tagus and Guadiana bordering on Spain, about thirty-six leagues long, and thirty-four broad. It is, from its fertility, called the granary of Portugal. The principal towns are Evora, Elvas, Campo-Mayor, Olivença, Villa-Viciosa, Estremoz, Moura, Castello-do-Vide, Mouraon, Serpa, and Aronches.

**ALENZON**, or **ALENCON**, a large handsome town of France, said to contain 10,000 inhabitants, in the department of Orne. *Lat* 48 18 N *Lon* 0 10 E.

**ALEPPO**, or **HALAB**, the capital of the Pachaic, and of all Syria, and the ordinary residence of the pacha, is situated in the vast plain which extends from the Orontes to the Euphrates, and which towards the south terminates in the desert. It is built on eight hills or eminences, on the highest of which the castle is erected, and is supposed to be the ancient Beraa. It is supposed to contain 300,000 inhabitants. *Lat* 35 45 N *Lon* 37 20 E.

**ALEPPO** (Old), is computed to be about twelve miles south of the present Aleppo.

**ALERT** *a* (*alerte*, Fr.) 1 Watchful, vigilant, ready at a call. 2 Brisk, pert, peevish (*Addison*).

**ALERTNESS** *s* (from *alert*) The quality of being alert, sprightliness, pertness (*Addison*).

**ALIES** (*αλις*) 1 Salt. 2 Any substance dried, rigid, and contracted by heat, as though pickled with salt.

**ALIBON**, a word used by Hippocrates, to denote meal.

**ALETRIS** In botany, a genus of the class and order hexandria monogynia. Corol funnel-form, wrinkled, stamens inserted on the base of the segments, capsule three-celled, the cells many-seeded. There are two species, one furnished by Africa and the other by North America. It is often confounded with other genera of the same order, and hence its species appear to be more numerous.

**ALEURITES**. In botany, a genus of the class and order monogynia monadelphia. Calyx three-cleft, corol five-petalled, perianth five-lobed. Male stamens numerous, united on one receptacle. Female, styleless two-seeded, berry globular, seeds with a double bark. The only is a native tree of New South

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**ALEUTIAN**, or **ALEUTSKY ISLANDS**, a group or chain of islands, on the north-east of Kamtschatka, and near the continent of America, belonging to Asiatic Russia. They were partly discovered by Behning in 1741.

**ALEWASHED** *a* (from *ale* and *wash*) Soaked in ale (*Shakspeare*).

**ALEWIFE** *s* (from *ale* and *wife*.) A woman that keeps an alehouse (*Swift*).

**ALEXANDER THE GREAT**, king of Macedonia. His father Philip laid the plan of that extensive empire, which his son afterwards established. The character and exploits of this hero are however so familiar to every body, that it is needless labour to dwell on them. All the world knows, says Mr Bayle, that he was a composition of very great virtues and very great vices. He had no mediocrity in any thing but his stature. In his other properties, whether good or bad, he was all extremes. His ambition rose even to madness, and his father was not at all mistaking in supposing the bounds of Macedonia too small for his son. For how could Macedon bound the ambition of a man, who reckoned the whole world too small a dominion? And yet the vast aims of this mighty conqueror, if seen under another point of view, may appear to have been confined in a very narrow compass, since, as we are told, the utmost wish of that great heart, for which the whole earth was not big enough was, after all to be praised by the Athenians for it is related that the difficulties which he encountered in order to pass the Hydaspes forced him to cry out, "O Athenians, could you believe to what dangers I expose myself for the sake of being celebrated by you!" Hence it is evident, he wanted to make all future time his own, and to be deemed an object of admiration to the latest posterity, yet did not expect this from the conquest of worlds, but from books. He was perfectly right, says Bayle, "for if Greece had not furnished him with good writers, he would long ago have been as much forgotten as the kings who reigned in Macedonia before Amphitryon."

Alexander was born at Pella, in the 356th year before Christ, and was educated by Aristotle. He died at Babylon, in consequence of a drunken debauch, in the thirty-second year of his age, after a reign of twelve years and eight months.

**ALEXANDER SEVERUS**, emperor of Rome, succeeded Heliogabalus about A D 222, when but sixteen years of age. His mother's name was Mammæa, and by her advice he in a great measure regulated his conduct. He applied himself to the reformation of abuses, the state having been greatly disordered by the vicious conduct of his predecessor, he was a most strict lover of justice, an encourager of learning and learned men, and favourable to the Christians. He made a successful expedition against the Persians, but endeavouring to reform his troops, who had grown very licentious, the late bad government, they murdered at the instigation of Maximinus, in the thirty-ninth year of his age, together with his mother, A D 235.

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There have been likewise several popes and several kings of Scotland named Alexander, as well as a minor poet, or two but we should not hold ourselves justified in filling our pages with accounts of them.

**ALEXANDERS**, in botany See **SMYRNIUM**

**ALEXANDRETTA** is the port of Aleppo, from which it is distant twenty-eight or thirty leagues. It is now little else but a heap of ruined houses, chiefly inhabited by Greeks, who keep tipping-houses for sailors. The air is very unwholesome, and therefore the better sort of inhabitants, during the hot weather, live at a village called Baylind, on a mountain about ten miles off, where there is wholesome water and excellent fruit. What surprises strangers most, when they arrive at this place, are the pigeons that carry letters to Aleppo, which they reach in about three hours. The pigeons are of a singular kind, and are very much celebrated throughout the east. Lat 36 34 N Lon 36 20 E

**ALEXANDRIA**, a famous city and capital of Egypt, built by Alexander the Great 323 years before Christ. It was taken from the Christians by Amr ibn al As, general of the caliph, in the middle of the sixth century, after a siege of fourteen months, in which he lost 23,000 men. It then contained four thousand baths, twelve thousand vendors of vegetables, four thousand Jews who paid tribute, &c. but what is still more to be regretted in its loss, the library, in which successive kings had collected more than six hundred thousand manuscripts, all of which were ordered to be destroyed by this ignorant Arabian. In modern times, it is the emporium of a very considerable commerce, the harbour for all the commodities of Egypt, by the Mediterranean except the rice of Damietta. The Europeans have establishments there, where factors dispose of the merchandise by cartel. Vessels are constantly to be met with from Marseilles, Leghorn, Venice, Russia, and the dominion of the grand signior, but it is not safe to winter there. The town is supplied by means of a canal from Faoua, which brings the water of the Nile to reservoirs in the time of its inundation, to serve the year. It is this canal which makes Alexandria a part of Egypt, for from its situation without the Delta it really belongs to Libya. The Turks call it Scandaria, or Lescandaria eleven leagues SW Rosetta thirty two NNW Cairo Lat 31 11 N Lon 30 16 E

**ALEXANDRIA** is also the name of a considerable town in the duchy of Milan, in Italy Lat 44 45 N Lon 8 43 E

**ALEXANDRIA** is likewise the name of a town in Virginia, on the south bank of the river Potomac Lat 38 30 N Lon 77 W About 9 miles distant from this town is Mount Vernon, the seat of the late general Washington.

**ALEXANDRIA**, (anc geog) a city of Arabia, called also Alexandropolis, on the river Araby (Stephanus, Isidorus, Characenus). — Another Alexandria in Gedrosia, built by Le-

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onatus, by order of Alexander (Pliny). — A third Alexandria in Asia, situated at the lake Arias (Ptolemy), but, according to Pliny, built by Alexander on the river Arius. — A fourth in the Bactriana (Pliny). — A fifth Alexandria, an inland town of Carmania (Pliny, Ptolemy, Ammian). — A sixth Alexandria, or Alexandropolis, in the Sogdiana (Isidorus, Characenus). — A seventh in India, at the confluence of the Acesines and Indus (Arian). — An eighth, called also Alexandretta, near the Sinus Issicus, on the confines of Cilicia and Syria, now Scanderoon, the port town to Aleppo. — A ninth Alexandria of Margiana, which being demolished by the barbarians, was rebuilt by Artabazus the son of Seleucus, and called Antiochia of Syria (Pliny), watered by the river Oxus, which is divided into several channels, for the purposes of watering the country, which was called Zotic. The city was seventy stadia in extent, according to Pliny, who adds, that, after the defeat of Crassus, the captives were conveyed to this place by Orontes, the king of the Parthians. — A tenth, of the Oxiana, built on the Oxus by Alexander, on the confines of Bactra (Pliny). — An eleventh, built by Alexander at the foot of mount Paropamisus, which was called Caucasus (Pliny, Arrian). — A twelfth Alexandria in Troas, called also Troas and Antigonia (Pliny). — A thirteenth, on the Tauricus, the boundary of Alexander's victories towards Bactria, and the last that he built on that side.

**ALEXANDRIAN**, in a general sense, is applied to all those who professed or taught sciences in the school of Alexandria. Alexandria in literature is more particularly understood of a college of priests, consecrated to the service of Alexander Severus after his deification.

**ALEXANDRIAN LIBRARY** This famous library was founded by Ptolemy Soter, for the use of an academy he instituted in Alexandria, and, by continual additions by his successors, became at last the finest library in the world, containing no fewer than 700,000 volumes. The method followed in collecting books for this library was to seize all those which were brought into Egypt by Greeks or other foreigners. The book was transcribed in the museum by persons appointed for that purpose, the originals were then delivered to the proprietors, and the originals laid up in the library.

In consequence of the establishment and great augmentation of this library, the sciences long flourished in the school of Alexandria. When a little before the middle of the 7th century (A D 635), a tremendous storm arose, which threatened their total destruction in those times. Filled with all the wild enthusiasm, and militant religion inspired, the successors of Mohammed ravaged that vast extent of country which stretches from the east to the southern confines of Europe. All the cultivators of the arts and sciences, who from every nation had assembled in Alexandria, were driven away with ignominy. Some fell beneath the sword of the conquerors, others fled into remote countries to drag out the remainder

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of their lives in want. The places and the instruments which had served for making an immense number of astronomical observations, were involved in one common destruction. And finally, this valuable depository of human knowledge, the Alexandrian library, which had already suffered by fire under Julius Cæsar, was entirely delivered to the flames by the Arabs. John Philoponus, surnamed the Grammarian, a famous peripatetic philosopher, being at Alexandria when the city was taken by the Saracens, was admitted to familiar intercourse with Amrou, the Arabian general, and presumed to solicit a gift, inestimable in his opinion, though contemptible in that of the barbarians; and this was the royal library. Amrou was inclined to gratify his wish, but his rigid integrity scrupled to alienate the least object without the consent of the caliph. He accordingly wrote to Omar, whose well-known epistle was dictated by the ignorance of an antediluvian faustic. "If these writings of the Greeks agree with the Koran, they are good, and need not be preserved, if they differ from it, they are pernicious, and ought to be destroyed!"

**ALEXANDRIAN MANUSCRIPT**, a famous copy of the Scriptures, consisting of four volumes, in a large quarto size, which contains the whole Bible in Greek, including the Old and New Testament, with the Apocrypha, and some smaller pieces, but not quite complete. This manuscript is now preserved in the British Museum. It was sent as a present to king Charles I. from Cyrillus Lucaris, patriarch of Constantinople, by sir Thomas Rowe, ambassador from England to the grand signior, about the year 1628. Cyrillus brought it with him from Alexandria, where probably it was written. In a schedule annexed to it, he gives this account; that it was written, as tradition informed them, by Thecla, a noble Egyptian lady, about thirteen hundred years ago, not long after the council of Nice. But this high antiquity, and the authority of the tradition to which the patriarch refers, have been disputed, not are the most accurate biblical writers agreed about its age. Some think that it might have been written before the end of the fourth century, others are of opinion, that it was not written till near the end of the fifth century, or somewhat later. Those who are desirous of farther information concerning it, may consult the Prolegomena of Mill, Wetstein, and Grabe, or Marsh's Mahabes, vol. ii. p. 186, 209, 648, 690.

**ALEXANDRIAN, or ALEXANDRINE**, in poetry, a kind of verse consisting of twelve, or of twelve and thirteen syllables alternately, so called from a poem on the life of Alexander, written in this kind of verse by some French poet. It is little used, except by the French, whose tragedies are generally composed of Alexandrines.

Verse well characterized by Pope  
Is, at the last, a only couplet brought  
Some undesigning thing they call a

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A needless Alexandrine ends the song,  
That, like a wounded snake, drags its slow  
length along. *Many an Ovidian.*

**ALEXICACUM** (*ἀλεξικακόν*, from *ἀλεξω*, to drive away, and *κακόν*, evil) An antidote, or antidote to resist poison.

**ALEXICACUS**, in antiquity, was an attribute of Neptune, whom the tunny-fishers used to invoke under this appellation, that their nets might be preserved from the *εἰς*, or sword-fish, which used to tear them.

**ALEXIPHARMACA**, **ALEXIPHARMACICA** (*ἀλεξίφάρμακα*, from *ἀλεξω*, to drive away, and *φάρμακον*, poison) Febrifuges. Medicines which expel or prevent the ill effects of poisons or any malignant infection.

**ALLAPYRETICA**, **ALLAPYRETICA** (*ἀλλήπυρετικά*, from *ἀλλεῖω*, to expel, and *πύρεξ*, a fever) Febrifuges.

**ALLATERICA** (*ἀλλήτερικα*, from *ἀλλεῖω*, to expel, and *τέρω*, to practice) Lapsive restoratives, or pick-natives to health.

**ALFICA**, or **ALPHETA**, in astronomy, the same as *Lacida coronæ*.

**ALF**, anciently signified a caldron, in which boiling water was put, for the accused to plunge in his arm up to the elbow, by way of trial or purgation.

**ALFORD**, a town in Lincolnshire, with a market on Tuesdays. Lat 53 16 N. Lon 0 13 E.

**ALI RAGAN**, a celebrated Arabic astronomer, flourished about the year 800. He wrote the Elements of Astronomy in thirty chapters or sections, chiefly following the system of Ptolemy. There are three Latin translations of this work, the best of which is by Golius of Leyden.

**ALFRED THE GREAT**, the youngest son of Ethelwulf, was born at Wantage, A.D. 849. He succeeded his brother Ethelred, though that prince left several children. He was crowned in 871, when the Danes were in the very heart of his dominions, and the seaports filled with their fleets. After several battles, with various success, Alfred was obliged to dismiss even his attendants; and having committed his wife and children to the care of some trusty subjects, disguised himself, and lived concealed in the little island of Athelney in Somersetshire at length, the Danes, finding they had no enemies to oppose them, grew negligent. This incited Alfred's friends to repair to their prince, who resolving to gain an accurate knowledge of their state, boldly entered the Danish camp in the disguise of a musician, and was admitted to play before their chiefs. Then returning to his friends, his troops were secretly assembled, and he soon surprised and defeated the Danes. Alfred behaved with great liberality on this occasion, giving up the kingdom of the East Angles to those of the Danes who embraced the Christian religion. Having now some respite, he employed himself in putting his kingdom into a state of defence, and in increasing his navy; and having recovered London from the Danes, he soon brought it into a flourishing state. After

some years' rest, a numerous fleet of Danes entered the Thames, and landed an immense body of troops in Kent. Those who were settled in Northumberland broke their treaty, and fitting out two fleets sailed round the coast, and committed great ravages. Alfred, however, pursued and defeated them, and made example of some of the pirates, by causing them to be executed at Winchester. At length he secured the peace of his dominions, and struck terror into his enemies, after fifty-six battles by land and sea, in all of which he was personally engaged. But what presents him most to our view, as an object of admiration, is his character as a reformer of laws and manners, and the promoter of learning. He composed a body of statutes, instituted the trial by jury, and divided the kingdom into shires and tithings. He was so exact in his government, that robbery was a crime unheard of, and valuable goods might be left on the high road, without danger of being meddled with. He also formed a parliament, which met in London twice a year. Learning, in his time was at so low an ebb that he himself complained, that from the Thames to the Humber, hardly a man could be found who understood Latin. To remedy this evil, he invited over learned men from all parts, and endowed schools in various parts of the kingdom, and if he were not the founder of the university of Oxford, certain it is, that he raised it to a state of reputation which it never enjoyed before. He was himself a learned prince, and composed several works. He divided the twenty-four hours into three equal parts, one devoted to the service of God, another to public affairs, and the third to refreshment. To Alfred we are indebted for the first for nation of a new establishment, and for being the first who sent out ships to make the discovery of a north east passage. In private life he was benevolent, pious, cheerful, and affable, and his person was amiable, dignified, and engaging. He died in 901, aged fifty-three. By his queen Eilsworth, Alfred had three sons and three daughters. He was succeeded by Edward his second son, commonly called Edward the Elder.

"Fortune alone," says Hume "by throwing Alfred into that barbarous age, deprived him of historians worthy to transmit his fame to posterity, and we wish to see him delineated in more lively colours, and with more particular strokes, that we may at least perceive some of those small specks and blemishes from which, as a man it is impossible he could be entirely exempted."

This prince, we are told, was twelve years of age before a master could be procured in the western kingdom to teach him the alphabet, such was the state of learning when Alfred began to reign. He had felt the misery of ignorance; and determined even to rival his contemporary Charlemagne in the encouragement of literature. He is supposed to have appointed persons to read lectures at Oxford, and may thence be considered as a founder of that university. By other proper establishments, and

by a general encouragement to men of abilities, he did every thing in his power to diffuse knowledge throughout his dominions. Nor was this end promoted more by his countenance and encouragement, than by his own example and his writings. For notwithstanding the lateness of his initiation, he had acquired extraordinary erudition; and, had he not been illustrious as a king, he would have been famous as an author. His works are, 1. *Breviarium quoddam collectum ex Legibus Trojanorum*, lib. 1. A Breviary collected out of the Laws of the Trojans, Greeks, Britons, Saxons, and Danes, in one book. Leland saw this book in the Saxon tongue at Christ-church in Hampshire. — 2. *Visi-Saxonum Leges*, lib. 1. The Laws of the West-Saxons, in one book. Pitts tells us, that it is in Bennet college library, at Cambridge. — 3. *Institutum quoddam*, lib. 1. Certain Institutes, in one book. This is mentioned by Pitts, and seems to be the second capitulation with Guthrum. — 4. *Contra Judices iniquos*, lib. 1. An Invective against unjust Judges, in one book. — 5. *Acta Magistratum suorum*, lib. 1. Acts of his Magistrates, in one book. This is supposed to be the book of judgments mentioned by Horne, and was, in all probability, a kind of reports, intended for the use of succeeding ages. — 6. *Regum Fortune variae*, lib. 1. The various Fortunes of Kings, in one book. — 7. *Dicta Sapientium*, lib. 1. The Sayings of Wise Men, in one book. — 8. *Parabolae et Saltes*, lib. 1. Parables and pleasant Sayings, in one book. — 9. *Collectiones Chronicorum* (Collections of Chronicles) — 10. *Epistolae ad Wulfstanum Episcopum*, lib. 1. Epistles to Bishop Wulfstan, in one book. — 11. *Manuale Meditationum* (A Manual of Meditations) — Besides the original works, he translated many authors from the Latin, &c. into the Saxon language, viz. 1. Bede's History of England. 2. Paulinus Orosius's History of the Pagans. 3. St Gregory's Pastoral, &c. The first of the 3, with his prefaces to the others, together with his laws, were printed at Cambridge, 1644. His laws were likewise inserted in Spelman's Councils. — 4. Boetius de Consolatione, lib. v. Boetius's Consolations of Philosophy, in five books. Dr Plot tells us, king Alfred translated it at Woodstock, as he found in a MS in the Cotton library. — 5. *Aesopi Fabulae* (Aesop's Fables) which he is said to have translated from the Greek into Latin and Saxon. — 6. *Psalterium Davidicum*, lib. 1. David's Psalter in one book. This was the last work the king attempted, death surprising him before he had finished it, it was however, completed by another hand, and published at London in 1640, in quarto, by sir John Spelman. Several others are mentioned by Malinsbury, and the old History of Ely asserts that he translated the Old and New Testaments.

**ALGAE** Flags. The second of the seven families, and the eighth of the nine tribes or nations into which Linnaeus divides all vegetables. Comprehending such as have the root, leaves, and stem all in one as the lichen or



liverworts, fisci or sea-weeds, &c. (See FAMILIES and NATIOMS, or GENES.) In Linnæus's artificial system, the algae occupy one of the orders of the class cryptogamia. In his *Fragments of a Natural Arrangement*, at the end of *Genera Plantarum*, they make the fifty-seventh section, and in *Philosophia Botanica* the sixty-sixth. See BOTANY.

**AL'GALA** (from *hollow*, Arab.) A hollow silver probe or catheter.

**ALGALI**, is used, by some of the old chemical writers, to signify nitre.

**ALGAROTTI** (Powder of), was first applied as an internal medicine, by Algorotti an Italian physician. It is a white oxyd of antimony, procured by adding purg water to the butter [oxy-muriate] of antimony, by which the metallic oxyd is precipitated this is then edulcorated by washing, and well dried. It is not now in the pharmacopœia of the London college, but is retained in that of Edinburgh.

**ALGAROTTI** (Francis), a polite writer, was the son of a merchant at Venice, where he was born in 1712. He received a liberal education, and then went abroad to different countries. He was at Paris in 1733, where he composed his *Newtonianism for the Ladies*. After making a pretty long stay in France, he came over to England, and then visited Germany. At Berlin he gained the friendship of Frederic the Great, who made him chevalier of the order of Merit, created him a count, and appointed him his chamberlain. The count died at Pisa, in 1764. His works were published in Italian, at Leghorn, 1765, in four vols 8vo and afterwards translated into French, in eight vols 8vo. In them the author appears to advantage as a connoisseur and a man of lively genius, but he was deficient in judgment and profound thinking.

**ALGAZEL**, in zoology. See ANTELOPE.

**ALGEBRA**, a general method of performing calculations, relative to all sorts of quantities, by means of indeterminate characters, or symbols.

Numbers and things were originally expressed by their names at full length. Afterwards these were abridged, and the initials of the words used instead of them, and, as the art advanced, the letters of the alphabet came to be employed as general representations of all sorts of quantities, known quantities being denoted by the first letters of the alphabet, *a, b, c*, &c. and unknown ones by the last letters *x, y, z*, &c. Other marks were gradually introduced, to express all kinds of operations and combinations, and the art soon became distinguished by different appellations as *l'Art de Algèbre*, the Greater Art, *Regula de la Cosa*, or the Rule of the Thing, *Regula Rei* &c. *Eni u*, the Rule of the Thing and the Product, *Speciosa Arithmetica*, *Lateral Arithmetica*, *Universal Arithmetica*, &c. This is one of the most important and useful branches of the mathematical sciences and may, in many respects, be considered as the key to the rest. Geometry delights us by the simplicity of its principles, and the elegance of its demonstrations. Arithmetic, though of great utility, commands our attention to determinate quantities, whereas it is by the slowness of its progress: it is tedious for finding certain results; but the sciences themselves furnish no rules. Whereas Al-

gebra is general and comprehensive, and may be applied with success in all cases where truths are to be obtained, and proper data can be established. Its great excellence is, that it deals in *generals*: it investigates and determines general solutions, general rules, general theorems, and general methods. Moreover, it has this peculiar property, that it not only investigates rules in all other parts of Mathematics, but by the most admirable art and dexterity, it discovers its own rules, models them according to any form, and varies them at pleasure, so as best to answer the ends proposed.

Algebra properly consists of two parts; first, the method of calculating magnitudes or quantities, as represented by letters, or other characters and ally, the manner of applying these calculations to the solution of problems.

In Algebra, as applied to the resolution of problems, the first business is to translate the problems out of the common into the algebraic language, by expressing all the conditions and quantities, both known and unknown, by their proper characters, arranged in an equation, or several equations if necessary, and treating the unknown quantity, whether it be number, or line, or any other thing, in the same way as if it were a known one this forms the composition. Then the resolution, or analytic part, is the disentangling the unknown quantity from the several others with which it is connected, so as to retain it alone on one side of the equation, while all the other, or known, quantities, are collected on the other side, and so giving the value of the unknown one. And as this disentangling of the quantity sought is performed by the converse of the operations by which it is connected with the others, taking them always backwards in the contrary order, it hence becomes a species of the analytic art, and is called the modern analysis, in contradistinction to the ancient analysis, which chiefly respected geometry, and its applications.

It would be attended with little or no advantage, were we to enter into an enumeration of the various fanciful etymologies of the name Algebra. We shall content ourselves with the mention of those which are most to be relied upon. The word *Algebra*, then, it is pretty certain, is Arabian. Lucas de Burgo testifies, that we had both the name and the art from the Arabian, and that the Arabic name was *Algebra e Almucabala*, which signifies the art of restitution and comparison, or opposition and comparison, or resolution and equation, all which agrees well enough with the nature of this art. Others derive it from the word *Geber*, which with the particle *al* (the) makes *Algeber*, and is purely Arabic, signifying the reduction of fractions to integers. Lucas de Burgo's account is, however, more probable.

To trace this science to its origin, and to point out the various alterations and improvements it has undergone in its progress, in a manner adequate to the curiosity and importance of the particulars, would occupy a volume. Yet, as an abridged outline of these matters may be found both useful and interesting, it is here presented to the reader.

As to the analytic art, of which Algebra is a species, it is doubtless as old as any science in the world, being the natural method by which the mind investigates truths, causes, and theories, from their observed effects and properties. Accordingly, traces of it are observable in the works of the earliest philosophers and mathematicians, the subjects of whose enquiries most of any require the

# ALGEBRA.

aid of such an art. And this process constituted their analysis. Of that part of analytics, which is properly called Algebra, the oldest treatise which has come down to us is that of Diophantus of Alexandria, who flourished about the year 350 after Christ, and who wrote, in the Greek language, thirteen books of Algebra or Arithmetic, as mentioned by himself at the end of his address to one Dionysius, though only six of them have hitherto been printed, and an imperfect book on multiplex numbers, namely in a Latin translation only, by Xilander, in the year 1575 and afterwards in 1621 and 1670 in Greek and Latin by Gaspar Bachet. These books, however, do not contain a treatise on the elementary parts of Algebra, but only collections of difficult questions relating to square and cube numbers and other curious properties of numbers, with their solutions. And Diophantus only prefaces the books by an address to Dionysius, for whose use it was probably written in which he just mentions certain *preconita*, as it were to prepare him for the problems themselves. In these remarks he shews the names and generation of the powers the square, cube, 4th, 5th, 6th &c which he call *dynamus* cubus, *dynamodinus*, *dynamocubus*, *cubocubus* according to the sum of the indices of the powers, and he marks these powers with the initials thus  $\delta^2$ ,  $\alpha^3$ ,  $\delta\delta^2$ ,  $\delta\alpha^3$ ,  $\alpha\alpha^4$ , &c the unknown quantity he calls simply  $\epsilon$  *ἀριθμός*, *numerus*, the number, and in the solutions he commonly marks it by the final thus  $\epsilon$ , also he denotes the monades, or indefinite unit, by  $\mu$ . This work is executed in a very acute and masterly manner, manifesting the utmost address and skill in the solutions, and forcing a persuasion that the author was deeply skilled in the science of Algebra, to one of the most abstruse parts of which these questions or exercises relate. Still, as he contrives his assumptions and notations so as to reduce all his conditions to a simple equation, or at least a simple quadratic, it does not appear what his knowledge was in the resolution of compound or affected equations.

Although Diophantus was the first author on Algebra that we now know of, it was not from him, but from the Moors or Arabians that we received the knowledge of Algebra in Europe, as well as that of many other sciences. And it is matter of dispute who were the first inventors of it, some ascribing the invention to the Greeks, while others say that the Arabians had it from the Persians, and these from the Indians, as well as the arithmetical method of computing by ten characters, or digits. But whoever were the inventors and first cultivators of Algebra it is certain that the Europeans first received the knowledge, as well as the name, from the Arabians or Moors, in consequence of the close intercourse which subsisted between them for several centuries. And it appears that the art was pretty generally known, and much cultivated, at least in Italy, if not in other parts of Europe also, long before the invention of printing, as many treatises upon the art in MS. are still extant in some of the most celebrated libraries and the authors who wrote first after the invention of printing mention several earlier writers on Algebra, from whom they learnt the art.

Algebra was first cultivated in Europe chiefly among the Italians. And the first author whose works we have in print was Lucas Paulolus, or Lucas de Burgo, a Cordelier, or Minorite Friar. He wrote several treatises of Arithmetic, Alge-

bra, and Geometry, which were printed in the years 1470, 1476, 1481, 1487, and in 1494 his principal work, intitled *Summa de Arithmetica, Geometria, Proportionibus, et Proportionalitas*, which is a very masterly and complete treatise on those sciences, as they then stood. He ascribes the invention of Algebra to the Arabians, and denominates the series of powers, with their marks or abbreviations, *A* n<sup>o</sup> or *numera*, the absolute or known number *ce* or *lo* a the thing or 1st power of the unknown quantity, *i* or *cruso*, the product or square, *cu* or *subo*, the cube, or 3d power; *ce ce* or *censo* de *cruso*, the square squared or 4th power, *po* *i* or *primo* *rel* to *lo* 5th power, *ce ce ce* or *censo li* *cubo*, the square of the cube, or 6th power, and so on compounding the names or indices according to the multiplication of the numbers 2, 3, &c and not according to their sum or addition, as used by Diophantus. He describes also the other characters made use of in this part, which are for the most part no more than the initials or other abbreviations of the words themselves; as

$R_r$  for *radix*, the root,  $R_r$  *radius de radici*, the root of the root,  $R_u$  *radix una r ale*, or *radix legata*, or *radix unita*  $R_{cu}$  *radius cuba*, and  $R_{cu}$

quantita, quantity, *p* for *piu* or plus, and *m* for *meno* or minus, and he remarks that the necessity and use of these two latter characters are for connecting, by addition or subtraction, different powers together, as  $3co\ p\ 4ce\ m\ 5cu\ p\ 2ce\ ce\ m\ 6n'$  that is,  $3x^3 + 4x^2 - 5x + 2x^2 - 6$ . *piu* 4 *centi* *meno* 5 *cubi* *piu* 2 *centi* *meno* 6 *numeri*, and thus, as we now write the same thing,  $3x^3 + 4x^2 - 5x^2 + 2x^2 - 6$ . From this book we learn what was the state of Algebra in Europe about the year 1500. It appears that the knowledge of the Europeans extended only to quadratic equations, of which they used only the positive roots, that they used only one unknown quantity, that they had no marks or signs for other quantities or operations, excepting only some few abbreviations of the words or numbers themselves, and that the art was only employed in resolving certain numerical problems. So that either the Africans had not carried Algebra beyond quadratic equations, or the Europeans had not learned the whole of the art, as it was then known to the former. And indeed it is highly probable that this latter was the case.

After the publication of the books of Luca de Burgo the science of Algebra became more generally known and improved especially by many persons in Italy, and about this time, or soon after, namely about the year 1505, the first rule was there found out by Scipio Ferro, for resolving one case of a compound cubic equation. But this science, as well as other branches of Mathematics, was most of all cultivated and improved there by Hieronymus Cardan of Bononia, a very learned man, whose arithmetical writings were the next that appeared in print, namely, in the year 1539, in nine books, in the Latin language, at Milan, where he practised physic, and read public lectures on Mathematics, and in the year 1545 came out a tenth book, containing the whole doctrine of cubic equations which had been in part revealed to him by Nicholas Tartalea, about the time of the publication of his first nine books.

The chief improvements made by Cardan, as collected from his writings, are stated below. 1st, Tartalea having only communicated to him the rules for resolving these three cases of cubic equations, viz



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$x^2 + bx + c$ , } he from thence raised a very large and complete work, laying down rules for all forms and varieties of cubic equation, having all their terms or wanting any of them, and having all possible varieties of signs, demonstrating all these rules geometrically, and treating very fully of almost all sorts of transformations of equations, in a manner here before unknown.

2d, It appears that he was well acquainted with all the roots of equations that are real, both positive and negative, or as he calls them, true and fictitious, and that he made use of them both occasionally. He also shewed that the even roots of positive quantities, and either positive or negative, that the odd roots of negative quantities, are real and negative, but that the even roots of them are impossible, or nothing at all common use.

3d, He was also acquainted with the number and nature of the roots of an equation, and that partly from the signs of the terms, and partly from the magnitude and relation of the coefficients. He knew

4th, That the number of positive roots is equal to the number of changes of the signs of the terms.

5th, That the coefficient of the second term of the equation, is the difference between the positive and negative roots.

6th, That when the second term is wanting, the sum of the negative roots is equal to the sum of the positive roots.

7th, How to compose equations that shall have given roots.

8th, That, changing the signs of the even terms, changes the signs of all the roots.

9th, That the number of roots failed in pairs, or what we now call impossible roots were always in pairs.

10th, To change the equation from one form to another, by taking away any term out of it.

11th, To increase or diminish the roots by a given quantity. It appears also,

12th, That he had a rule for extracting the cubic root of such binomials as admit of extraction.

13th, That he often used the literal notation,  $a, b, c, d$  &c.

14th, That he gave a rule for biquadratic equation, solving all their cases, and that, in the investigation of that rule, he made use of an assumed indeterminate quantity, and afterwards found its value by the arbitrary assumption of a relation between the terms.

15th, That he applied Algebra to the resolution of geometrical problems. And

16th, That he was well acquainted with the difficulty of what is called the irreducible case,  $x^3 + px + q = 0$ , upon which he spent a great deal of time in attempting to overcome it. And though he did not fully succeed in this case, any more than other persons have done since, he nevertheless made many ingenious observations about it, laying down rules for many particular forms of it, and shewing how to approximate very nearly to the root in all cases whatsoever.

Nicholas Tartalea, or Tartaglia, of Brescia, was contemporary with Cardan, and was probably older than he was, but we do not know of any book of Algebra published by him till the year 1546, the year after the date of Cardan's work on Equations, when he printed his *Questis* (or *Questions*) at Venice, where he resided as a lecturer on mathematics. Tartalea made

on in the notation or forms of expres-

sion used by Lucas de Burgo, calling the first power of the unknown quantity, in his language, *cosa*, the second power *cossa*, the third *cubo*, &c. and writing the names of all the operations in words at length, without using any contractions, except the initial  $R$  for root or radicality. So that the only things remarkable in this collection, are the discovery of the rules for cubic equations, and the curious circumstances attending the same, particularly the correspondence and conferences which took place between him and Cardan. In the course of these Tartalea was overcome by the most solemn protestations and promises of secrecy that could be made, to communicate his rules for cubics to Cardan, who, notwithstanding his plighted faith, published these rules in a work of which we have just spoken, and thus stimulated Tartalea to write on the subject, chiefly with a view to the exposure of this very censurable conduct.

About the time that Cardan and Tartalea flourished in Italy, the science of Algebra was cultivated in Germany by Stifelius and Scheubelius. Stifelius's *Arithmetica Integra* was published at Norimberg in 1544, being the year before Cardan's work on cubic equations, it is an excellent treatise both on Arithmetic and Algebra. From an examination of this work of Stifelius, it appears that the improvements made by himself, or other Germans, beyond those of the Italians, as contained in Cardan's book of 1539 were as follow.

1st He introduced the characters  $+$ ,  $-$ ,  $\sqrt{\quad}$ , for plus, minus, and root or radix, as he calls it.

2d The initials  $2, 3, 4$ , &c. for the powers.

3d He treated all the higher orders of quadratics by the same general rule.

4th He introduced the numeral exponents of the powers,  $-3, -2, -1, 0, 1, 2, 3$  &c. both positive and negative, so far as integral numbers, but not fractional ones, calling them by the name *exponents*, exponent and he taught the general use of the exponents, in the several operations of powers, as we now use them, or the logarithm.

5th, And lastly, he used the general literal notation  $A, B, C, D$  &c. for so many different unknown or general quantities.

John Scheubelius wrote much about the time of Cardan and Stifelius, but as he takes no notice of cubic equations, it is likely that he had neither seen nor heard any thing about them. He treats pretty largely upon surds, and gives a general rule for extracting the root of any binomial or residual  $a \pm b$ , where one or both parts are surds, and a the greater quantity, namely, that the square

root of it is  $\sqrt{a + \frac{\sqrt{a^2 - b^2}}{2}} \pm \sqrt{\frac{a - \sqrt{a^2 - b^2}}{2}}$ .

which he illustrates by many examples.

A few years after the appearance of these treatises in Italy and Germany, Robert Recorde, a celebrated mathematician and physician, born in Wales, proved by his writings that Algebra was not altogether unknown in England.

The first part of his Arithmetic was published in 1552, and the second part in 1557, under the title of, "The Whetstone of Witte, which is the seconde parte of Arithmetike containing the Extraction of Rootes. The Cosike Practise, with the Rule of Equation and the Worke of Sayde Numbers." The particulars which are new in the works of this author, are

1 The extraction of the roots of compound algebraic quantities.

2 The use of the terms binomial and residual.

3 The use of the sign of equality, or  $=$ .

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The first edition of Peletarius's algebra was printed in 478 at Paris, in 1338, under this title, *Jacobi Peletarii Ciconiensi, de occultis partibus Numerorum, quodam Algebrae vocant, Liber primus*. This is a very ingenious and masterly composition, treating in an able manner upon the several parts of the subject then known, except cubic equations. His real discoveries or improvements are these

1st That the root of an equation is one of the divisors of the absolute term

2d. He taught how to reduce trinomials to simple terms, by multiplying them by compound factors

3d He taught curious precepts and properties concerning square and cube numbers, and the method of constructing a series of each by addition only, namely, by adding successively their several orders of differences

Peter Ramus wrote his arithmetic and algebra about the year 1560. His notation of the powers is thus,  $1, q, c, by$ , being the initials of *latus*, *quadratus*, *cubus*, *biquadratus*. He treats only of simple and quadratic equations

Raphael Bombelli's algebra was published, at Bologna, in the year 1579, in the Italian language the dedication, however, is dated 1572. In this work we meet with little improvement or alteration, except in the notation, where he uses  $\sqrt{\quad}$  for the unknown quantity, with the numeral indices of *Stifelius*

The arithmetic of Simon Stevin of Bruges, was published in 1585, and his algebra a short time afterwards. A general air of originality runs through the whole of this latter work of Stevinus, yet his more peculiar and remarkable inventions may be reduced to these

1st He invented a new character for the unknown quantity namely, a small circle  $\bigcirc$  *within* which he placed the numeral exponent of the power. He also greatly improved the designation of powers, by such numeral exponents, first given by *Stifelius* as to integral exponents but extended by Stevinus to fractional and all other sorts, thereby denoting all sorts of roots the same way as powers, by numeral exponents. A circumstance hitherto thought to be of much later invention

2d He improved and extended the use and notation of coefficients, including in them fractions and radicals and all sorts of numbers in general

3d A quantity of several terms he called generally a multinomial, and he denoted all nominals whatever by particular names expressing the number of their terms, binomial, trinomial, quadrinomial, &c.

4th A numeral resolution of all equations whatever by one general method

Besides which, he hints at some unknown author as the first inventor of the rules for cubic equations, by whom may probably be intended the author of the Arabic manuscript treatise on cubic equations, given to the library at Leyden by the celebrated Warner

Most of Vieta's algebraical works were written about the year 1600, or a little before, but some of them were not published till after his death, which happened in the year 1603. And his whole mathematical works were collected together by Francis Schooten, and elegantly printed in a folio volume in 1646. Of these the algebraical parts are as follow

- 1 *Isagoge in Artem Analyticam*
- 2 *Ad Logisticen Speciosam Notae priorae*
- 3 *Zeticorum libri quinque*

4 *De Aequationum Recognitione, & Emendatione*

5 *De Numerosâ Potestatum ad Exagessim Resolutione*

The real inventions of this very ingenious author, are stated in the following particulars

1st He introduced the general use of the letters of the alphabet, to denote indefinite given quantities, which had only been done in some particular cases before his time. But the general use of letters for the *unknown* quantities was before pretty common with *Stifelius* and his successors. Vieta uses the vowels A, B, C, D, E, F, G, H, I, K, L, M, N, O, P, Q, R, S, T, U, V, X, Y, Z, for the unknown quantities, and the consonants B, C, D, &c for known ones

2d He invented, and introduced many expressions or terms, several of which are in use to this day such as coefficient, affirmative and negative, pure and affected, or affected in *degrees*, homogeneous affectionis, homogeneous comparisonis, the line of vinculum over compound quantities, thus  $A + B$ . His method of setting down his equations, is to place the homogeneous comparisons, or absolute known term, on the right-hand side alone, and on the other side all the terms which contain the unknown quantity, with their proper signs

3d In most of the rules and reductions for cubic and other equations, he made some improvements, and variations in the modes

4th He shewed how to change the root of an equation in a given proportion.

5 He derived or raised the cubic and biquadratic, &c equations, from quadratics, not by composition in Harriot's way, but by squaring and otherwise multiplying certain parts of the quadratic. And as some quadratic equations have two roots, therefore the cubics and others raised from them, have also the same two roots, and no more. Hence he comes to know what relation these two roots bear to the coefficients of the two lowest terms of cubic and other equations, when they have only three terms, namely, by comparing them with similar equations so raised from quadratics and, on the contrary, what the roots are, in terms of such coefficients

6 He made some observations on the limits of the two roots of certain equations

7 He stated the general relation between the roots of certain equations and the coefficients of their terms, when the terms are alternately plus and minus, and none of them are wanting, or the roots all positive

8 He extracted the roots of affected equations by a method of approximation similar to that for pure powers.

9 He gave the construction of certain equations, and exhibited their roots by means of singular sections, before adverted to by Bombelli.

Albert Girard, an ingenious Flemish mathematician, died about the year 1633. The work which entitles him to notice in this history, is his "*Invention Nouvelle en l'Algebre, tant pour les solutions des equations, que pour reconnaitre le nombre des solutions qu'elles recoivent, avec plusieurs choses qui sont necessaires a la perfection de ceste divine science*," which was printed at Amsterdam 1629, in small quarto, in 62 pages, viz. 49 pages on Arithmetic and Algebra, and the rest on the measure of the superficies of spherical triangles and polygons, by him then lately discovered. From this work of Girard's we learn,

1st, That he was the first person who understood the general doctrine of the formation of the coefficients of the powers, from the sums of their roots, and their products, &c

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2d. He was the first who understood the use of negative roots in the solution of geometrical problems.

3d. He was the first who spoke of the imaginary roots, and understood that every equation might have as many roots real and imaginary and no more, as there are units in the index of the highest power. And he was the first who gave the whimsical name of *quantities less than no thing* to the negative. And,

4th. He was the first who discovered the rules for summing the powers of the roots of any equation.

The celebrated Thomas Harriot flourished about the year 1610, near which time it is probable he wrote his algebra. His inventions and improvements were important, though they may be comprehended in three particulars.

1st. He introduced the uniform use of the small letters *a, b, c, d*, &c. viz. the vowels *a, e, i* for unknown quantities, and the consonants *b, c, d, f* &c. for the known ones, which he joins together like the letters of a word, to represent the multiplication or product of any number of these literal quantities, and prefixing the numeral coefficient as we do at present, except only separated by a point, thus *3 b c* for a root he set the index of the root after the mark  $\sqrt{\quad}$ , as  $\sqrt[3]{\quad}$  for the cube root. He also introduced the characters  $>$  and  $<$  for greater and less, and in the reduction of equations, he arranged the operations in separate steps or lines, setting the explanations in the margin on the left hand, for each line. By which, and other means, he may be considered as the introducer of the modern state of algebra, which quite changed its form under his hands.

2d. He shewed the universal generation of all the compound or affected equations by the continued multiplication of so many simple ones, or binomial roots, thereby plainly exhibiting to the eye the whole circumstances of the nature, mystery and number of the roots of equations, with the composition and relations of the coefficients of the terms, and from which many of the most important properties have since been deduced.

3d. He greatly improved the numeral exercises or extraction of the roots of all equations, by clear and explicit rules and methods drawn from the foregoing generation or composition of affected equations of all degrees.

Oughtred's *Clavis* was first published in 1631, the same year in which Harriot's algebra was published by his friend Warner. Oughtred chiefly follows Vieta, in the notation by the capitals, the designation of products, powers, &c. though with a few variations.

He was the first, as far as we can learn, who set down the decimals without their denominators, he expressed them thus,  $21\frac{56}{100}$ .

2d. In algebraic multiplication, he either joins the letters, which represent the factors, together like a word, or connects them by the mark  $\times$ , which is the first introduction of this character.

3d. He seems to be the first who used points to denote proportions thus  $7:9 :: 28:36$ ; and for continued proportion he has this mark  $:-$ .

4th. He denoted roots by the common radical  $\sqrt{\quad}$ , for square root,  $\sqrt[3]{\quad}$  for cube,  $\sqrt[4]{\quad}$  for 4th,  $\sqrt[5]{\quad}$  for 5th,  $\sqrt[6]{\quad}$  for 6th, &c. questions he gives explicit and general rules for the several sorts of reductions. He put  $\frac{1}{2}$  after  $\sqrt{\quad}$  for universal, instead of *lumen* of Vieta. He observes, that all the

powers of  $A + \sqrt{B}$  are positive, but those of  $A - \sqrt{B}$  have terms alternately positive and negative. And

5th. In this work we meet with the first instance of applying algebra to geometry, so as to investigate new geometrical properties.

In 1634 Herigone published, at Paris, the first course of mathematics, in five vols. 8vo, in the second of which is contained a good treatise on algebra, in which he uses the notation by small letters, introduced by the algebra of Harriot, which was published three years before, though the rest of it does not resemble that work, and one would suspect that Herigone had not seen it. The whole of this piece bears evident marks of originality and ingenuity. Besides  $+$  for *plus*, he uses  $-$  for *minus*, and  $=$  for *equality*, with several other useful abbreviations and marks of his own. In the notation of powers he does not repeat the letters like Harriot, but subjoins the numeral exponents, to the letter, as Descartes did three years afterwards. And Herigone uses the same numeral exponents for roots, as  $\sqrt[3]{\quad}$  for the cube root.

Descartes's geometry was first published in 1637, being six years after the appearance of Harriot's algebra. This work of Descartes's was rather an application of algebra to geometry, than either algebra or geometry separately considered. Still he made improvements in both, and with respect to the science of algebra, we may speak both of his improvements and his inventions. And

1st. Of his improvements. That he might fit equations the better for their application in the construction of problems, Descartes mentions, as it were by the-by, many things concerning the nature and reduction of equations, without troubling himself about the first inventors of them, stating them in his own terms and manner, which is commonly more clear and explicit, and often with improvements of his own. And under this head we find that he chiefly followed Cardan, Vieta, and Harriot, but especially the last, and explains some of their rules and discoveries more distinctly, and varies but a little in the notation, putting the first letters of the alphabet for the known, and the latter letters for the unknown quantities, also  $aaa$  for  $aaa$ ,  $abc$  for  $abc$ , and  $so$  for  $=$ . But Herigone used the numeral exponents in the same manner three years before. Descartes explained or improved most parts of the reductions of equations, in their various transmutations, the number and nature of their roots, true and false, real and what he calls imaginary, called involved by Cardan, and the depression of equations to lower degrees.

2d. As to his inventions and discoveries in algebra, they may be comprehended in these particulars, namely, the application of algebra to the geometry of curve lines, the constructing equations of the higher orders, and a rule for resolving biquadratic equations by means of a cubic and two quadratics.

In 1644 Renaldine published in 4to, *Opus Algebraicum*, both ancient and modern, with mathematical resolution and composition. And in 1665, in folio, the same, greatly enlarged, or rather a new work, which is very heavy and tedious. In this work Renaldine uses the parentheses  $(a^2 + b^2)$  as a vinculum, instead of the line over, as  $a^2 + b^2$ .

Indeed after the publication of the geometry of Descartes, a great many other ingenious men followed the same course, applying themselves to algebra and the new geometry, to the mutual improvement of them both, which was done chiefly

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By reasoning on the nature and forms of equations, as generated and compared by Harriot, Horner, &c. It is proper to take notice here of Fermat, a learned and ingenious mathematician, who was contemporary and a competitor of Descartes for his brightest discoveries, which he was in possession of before the geometry of Descartes appeared. Namely, the application of algebra to curve lines, which he expressed by an algebraical equation, and by them constructing equations of the 3d and 4th orders; also a method of tangents, and a method de maximis et minimis, which approach very near to the method of fluxions or increments, which they strikingly resemble both in the manner of treating the problems, and in the algebraic notation and process.

Hudde, who was a burgo-master of Amsterdam, discovered a very beautiful theorem relative to equations which contain equal roots. He shewed that, if we multiply the terms of such an equation by those of an arithmetical progression, the sum of the products is equal to zero, and that it forms a new equation which contains, with the exception of one, roots equal to those of the equation proposed. On this property he founded a very simple rule to discover the greatest or the least augmentation to which a variable quantity could arrive.

About this time the minds of all mathematicians were directed towards the improvement and extension of algebra. Thus, in 1655, Wallis published his *Arithmetica Infinitorum*, being a new method of reasoning on quantities, or a great improvement on the indivisibles of Cavalierius, and which in great measure led the way to infinite series, the universal application of the binomial theorem, and the method of fluxions, the two latter of which were both soon after discovered by Newton. In this work Wallis treats ingeniously (though in the estimation of many rather loosely) on quadratures, &c. and gives the first expression for the quadrature of the circle by an infinite series. It was Wallis likewise who substituted the fractional exponents in the place of radical signs, by which the operations are in many cases much facilitated and abridged. Huygens, Barrow, and other mathematicians, resolved by the algebraical calculus, many problems which the ancients could never attack with success.

In 1707 was published by Mr Whiston, the first edition of Sir Isaac Newton's *Arithmetica Universalis: sive de compositione et resolutione arithmetica liber* and many editions have been published since. This work was the text book used by our great author in his lectures, while he was professor of mathematics in the university of Cambridge. And although it was never intended for publication, it contains many and great improvements in analytics, particularly in the nature and transmutation of equations, the limits of the roots of equations; the number of impossible roots, the invention of divisors, both surd and rational, the resolution of problems, arithmetical and geometrical, the linear construction of equations, approximating to the roots of all equations, &c. In the later editions of the book is commonly ascribed Dr. Halley's method of finding the roots of equations. As the principal parts of this work are not adapted to the circumstances of beginners, there have been published commentaries upon it by several persons, as Gravesande, Cession, Wilder, &c. Many of Newton's algebraical discoveries were farther developed and

explained by Halley, Macleaurin, Nicole, Stirling, Euler, Clairaut, &c.

The exponential formulae for the sines and cosines of arcs, were first given by Demouivre, and greatly contributed to the extension of the analytical part of trigonometry, by abridging its operations and shortening the labour of investigation. A considerable improvement too, in this branch of the subject, or in what is usually called the arithmetic of sines, was introduced, we believe, by Euler, who instead of using separate letters to represent the different trigonometrical lines belonging to the same arc,  $a$  for instance, gives the abbreviations  $\sin a$ ,  $\cos a$ ,  $\tan a$ ,  $\cot a$ ,  $\sec a$ ,  $\csc a$ , &c. a method which considerably relieves the memory, and saves the trouble of repeated reference to the original notation.

The theory of series comprehends many branches, all of which have been cultivated with success during the last two centuries. James Bernoulli, L'aylor, Nicole, Stirling, Macleaurin, Euler, Lambert, Landen, and Waring, are the most distinguished in these researches. Recurring series were presented for the first time by Demouivre, on occasion of considering the doctrine of chances, a fertile branch of the modern analysis. But it was in the hands of Daniel Bernoulli, of Euler, and of P. Riccati, that with the simple succour of the ordinary algebra, the theory of this kind of series was augmented and generalized.

The general resolution of equations of all degrees has drawn much attention down to the present time. But though the celebrated mathematicians who have been employed about this problem, as Bezout, Iacobi, Lagrange, Waring, &c. have made new observations on the nature of equations and on the form of their roots, they have not completely resolved the fifth degree, nor any of superior orders: but the nature of this article will not permit of our minutely describing their labours, and the benefits which the science has derived from them.

Having thus gone through a regular review of the various authors, whose performances have gradually contributed to reduce the science of algebra from its rude and rustic state, to its modern and more polished form, we shall conclude our history by enumerating the names of those authors, whose works it will be most advisable for the student to consult. These are, Schooten, M de Raune, Slusius, Branner, Wallis, Newton, Kersey, Leibnitz, Bulliald, Baker, Rolle, De Lagny, Ward, De Moivre, Sault, Ozanam, Harriot, B Taylor, Ronayne, Stirling, Macleaurin, Gravesande, Simpson, Saunderson, De la Caille, Imerson, Clairaut, Dodson, Landen, Euler, Maclaurin, Bonnycastle, Morgna, Wood, Friend, Manning, Lacroix, Lagrange, and Waring, the latter of whom has made many improvements and discoveries, in series, and other higher parts of algebra.

This historic sketch of the inventions and discoveries in this branch of science will, we trust, be found not only entertaining, but of great utility. In the composition of it we have been much assisted by freely availing ourselves of the very comprehensive, elaborate, and instructive history of ALGEBRA, given under that article in Dr Hutton's *Mathematical and Philosophical Dictionary* an article, to which, on account of its sterling value and importance, we with pleasure and confidence refer the curious reader for further information. We now proceed to a concise sys-

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systematic view of the principal definitions, rules, and operations, in this department of science; as below:

## DEFINITIONS

**ALGEBRA** is the science which reduces to computation magnitudes in general, as arithmetic is devoted to the calculation of numbers in particular.

**ALGEBRA, num. rel.** is that which is chiefly concerned in the solution of numeral problems, and in which all the given quantities are expressed by numbers.

**ALGEBRA, spe. rel.** is *literal*, is that commonly used by the moderns, in which all quantities whether known or unknown, are expressed by general characters as letters, &c. in consequence of which general designation, all the conclusions become universal theorems for performing every operation of a similar nature with that for which the investigation was instituted.

Every figure or arithmetical character has a determinate and individual value, as, for example, the figure 4 always represents one and the same number, namely, the collection of four units; algebraical characters, on the contrary, must be general, independent of any particular signification, and proper to represent all sorts of quantities, according to the nature of the questions to which they are applied; further, they must be simple, and easy to describe, so as not to be troublesome in operation, or fatiguing to the memory. These advantages meet in the letters of the alphabet, which are, therefore, usually adopted to represent magnitudes in algebra.

In algebraical enquiries some quantities are assumed as known or given, and others are unknown and to be found out: the former are commonly represented by the leading letters of the alphabet *a, b, c, d*, &c. the latter by the final letters, *w, x, y, z*. Though it often tends to confuse the memory, if the initial letter of the subject under consideration be made use of, whether that be known or unknown: thus, *r* may denote a radius, *b* a base, *p* a perpendicular, *s* a side, *d* density, *m* mass, &c.

The characters used to denote the operations are principally these:

- + signifies addition, and is named *plus*
- − signifies subtraction, and is named *minus*
- × denotes multiplication, and is named *into*
- ÷ denotes division, and is named *by*
- √, the mark of radicality denotes the square root, with a 3 before it, thus  $\sqrt[3]{x}$ , the cube root with a 4, thus  $\sqrt[4]{x}$ , the fourth or biquadrate root, thus  $\sqrt[n]{x}$ , the *n*th root.

$\frac{a}{b}$  is commonly denoted by a colon between the antecedent and consequent of each ratio: while a colon between the two ratios is to be read as *a* to *d*, we state it as follows,

$=$  is the symbol of equality  
Hence  $a + b$ , denotes the sum of the quantities represented by *a* and *b*  
 $a - b$  denotes their difference when *b* is the less  
 $b - a$  their difference when *a* is the less.  $a \vee b$  the difference when it is not known which is the greater.  $a \times b$ , or  $a \cdot b$ , or  $ab$  represents the product of *a* multiplied into *b*.

$\frac{a}{b}$ , or  $\frac{a}{b}$ , shows that the number represented

*a* is to be divided by that which is represented by *b*.

$\frac{1}{a}$  is the reciprocal of *a*, and  $\frac{1}{b}$  the reciprocal of *b*.  
 $a \propto b$ , *c* *d* denotes that *a* is in the same proportion to *b*, as *c* is to *d*.

$x = a - b + c$  is an equation, shewing that *x* is equal to the difference of *a* and *b*, added to the quantity *c*.

$\sqrt{a}$ , or  $a^{\frac{1}{2}}$ , is the square root of *a*;  $\sqrt[3]{a}$ , or  $a^{\frac{1}{3}}$ , is the cube root of *a*; and  $\sqrt[n]{a}$ , or  $a^{\frac{1}{n}}$ , is the *n*th root of *a*.

$a^4$  is the square of  $a^2$ ,  $a^3$  the cube of *a*;  $a^4$  the fourth power of *a* and  $a^m$  the *m*th power of *a*.

$(a + b) \times c$ , or  $(a + b) c$ , is the product of the compound quantity  $a + b$  multiplied by the simple quantity *c*. Using the bar  $\overline{\quad}$ , or the parenthesis  $(\quad)$  as a vinculum, to connect several quantities into one.

$\frac{a + b}{a - b}$ , or  $\frac{a + b}{a - b}$ , expressed like a fraction, is the quotient of  $a + b$  divided by  $a - b$ .

*5x* denotes that the quantity *x* is to be taken 5 times, and  $7(b + c)$  is 7 times  $b + c$ . And these numbers, 5 or 7, shewing how often the quantities are to be taken, or multiplied, are called coefficients.

Like quantities, are those which consist of the same letters, and powers. As *a* and  $3a$  or  $2ab$  and  $4b$ , or  $3abc$ , and  $-5a^{\frac{1}{2}}$ .

Unlike quantities, are those which consist of different letters, or different powers. As *a* and *b* or  $2a$  and  $a^2$  or  $3ab^2$  and  $3abc$ .

Simple quantities, or monomials, are those which consist of one term only. As  $3a$ , or  $5ab$  or  $6abc^2$ .

Compound quantities, are those which consist of two or more terms. As  $a + b$  or  $a + 2b - 3c$ .

And when the compound quantity consists of two terms, it is called a binomial; when of three terms, it is a trinomial, when of four terms, a quadrinomial; more than four terms, a multinomial, or polynomial.

Positive or affirmative quantities, are those which are to be added, or have the sign +. As *a* or + *a*, or *ab* for when a quantity is found without a sign, it is understood to be positive, or to have the sign + prefixed.

Negative quantities, are those which are to be subtracted. As  $-a$ , or  $-2ab$ , or  $-3ab^2$ .

Like signs, are either all positive (+), or all negative (−).

Unlike signs, are when some are positive (+), and others negative (−).

In every quantity we may consider two things, its value, and its manner of existing with regard to other magnitudes which enter with it into the same calculation. The value of a quantity is expressed by the letter or by the character destined to represent the number of its units. But as to the mode of existence some with regard to others, magnitudes may affect the calculation either in the same or in opposite senses; which renders it necessary to distinguish two sorts of quantities, positive and negative. Thus whether a man have 1000 pounds in property or stock, or be 1000 pounds in debt, may be represented by characters, either arithmetical or algebraical, but since an actual property is directly opposite in its nature to a debt, the two must be marked by different symbols; so that, if property be reckoned a positive quantity and marked +, a debt owed must be reckoned as negative, and marked −. Again, if a commodity be at the same point, known to weigh

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the east be considered as a positive quantity in an investigation, motion towards the west, which is opposite to the former, must enter the same calculation as a negative quantity. If the elevations of the sun above the horizon are considered as positive quantities, the depressions of the sun below the horizon must be treated as negative quantities. It is the same with all quantities which when considered together, exist differently with respect to one another.

A residual quantity, is a binomial having one of the terms negative. As  $a - 2b$ .

The power of a quantity ( $a$ ) is its square ( $a^2$ ), or cube ( $a^3$ ), or biquadrate ( $a^4$ ), &c. called also the 2d power, or 3d power, or 4th power &c.

The index or exponent, is the number which denotes the power or root of a quantity. So 2 is the exponent of the 2d power  $a^2$ , and 3 is the index of the cube or 3d power  $a^3$ , and 1 is the index of the square root  $a^{\frac{1}{2}}$  or  $\sqrt{a}$  and 1

is the index of the cube root  $a^{\frac{1}{3}}$  or  $\sqrt[3]{a}$ .

A rational quantity is that which has no radical sign ( $\sqrt{\quad}$  or index annexed to it. As  $a$ , or  $3b$ .

An irrational quantity, or irrational, is that which has not an exact root, or is expressed by means of the radical sign  $\sqrt{\quad}$ . As  $\sqrt{a}$ , or  $\sqrt{a^2}$ , or  $\sqrt[3]{a}$ , or  $a^{\frac{1}{2}}$ .

The reciprocal of any quantity is that quantity inverted, or unity divided by it. So, the reciprocal of  $a$ , or  $\frac{1}{a}$  and the reciprocal of

$$\frac{1}{b} \text{ is } \frac{b}{a}$$

## SECT I. In Addition, Subtraction

The fundamental operations are the five performed by Addition, Subtraction, Multiplication, and Division.

### PROB I. To add Quantities.

Simple quantities, or the terms of compound quantities, to be added together, may be like, or unlike sign, like, or unlike sign, or they may be unlike. Case 1. To add terms that are like and have like signs.

Rule. Add together the coefficients to their sum prefix the common sign and subjoin the common letter or letters.

Example	10 $5ab$	$3a - 1b$
	Add $4ab$	$7a - 2b$
	Sum $9ab$	$4a - 5b$
		$13a - 8b$

Case 2. To add terms that are like, but have unlike signs.

Rule. Subtract the less coefficient from the greater, prefix the sign of the greater to the remainder, and subjoin the common letter or letters.

Example	$-4a$	$+7b$	$-5b$
	$+7a$	$-3b$	$+2b$
	$+3a$	$+6b$	$+3ab$
		$+5b$	$0$

Case 3. To add terms that are unlike.

Rule. Set them all down, one after another, with their signs and coefficients prefixed.

$$2a + 3b - 5 + 3$$

Compound quantities are added together, by writing the several terms of which they consist by the preceding rules.

Example The sum of 
$$\begin{cases} 5ab - 2xy - 12cd \\ 7xy - ab + 15 \\ 9cd - 4xy - 4mn \end{cases}$$

Note. In this rule the word addition is very improperly used, being too strictly to express the operation here performed. The business of this operation is to incorporate into one mass, or algebraic expression, different algebraic quantities, as far as an actual incorporation or union is possible, and to retain the algebraic marks for doing it, in cases where the former is not possible. When we have several quantities, some affirmative and some negative, and the retention of these quantities can in the whole or in part be discovered, such incorporation of two or more quantities into one, is plainly effected by the foregoing rules.

It may seem a paradox that what is called addition in algebra, should sometimes mean subtraction, and sometimes subtraction. But the paradox wholly arises from the strictness of the name given to the algebraic process, from employing an old term in a new and more enlarged sense. Instead of addition, call it incorporation, or union, or striking a balance, or any name to which more extensive idea may be annexed than that which is usually implied by the word addition, and the paradox vanishes.

### PROB II. To subtract Quantities.

General Rule. Change the signs of the quantity to be subtracted into the contrary signs, and then add it, so change the quantity from which it is to be subtracted the same as usual by this addition is the remainder.

Example	From $+5a$	$7ab - 16bc$
	Subtract $3a + 5b$	$3a + 5b$

$$\text{Rem } +2a - 4b - 16bc - mb$$

When a positive quantity is to be subtracted, the rule is obvious. In order to know, when the negative part of a quantity is to be subtracted, let  $c - d$  be subtracted from  $a$ , the remainder according to the rule, is  $a - c + d$ . For if  $a$  is subtracted from  $a$ , the remainder is  $0 - c$  but this is too small, therefore  $c$  is subtracted instead of  $-c$ , which is less than it by  $c$  the remainder, therefore is too small by  $d$ , and  $d$  being added, it is  $a - c + d$  according to the rule.

### PROB III. To multiply Quantities.

General Rule for the Signs. When the signs of the two terms to be multiplied are like, the sign of the product is  $+$ , but when the signs are unlike, the sign of the product is  $-$ .

Case 1. To multiply two terms.

Rule. Find the sign of the product by the general rule, and it please the product of the numerical coefficient, and set down the letters one after another.

Mult	$+a$	$+ab$	$-5cd$
By	$+b$	$-3$	$-7ab$
	$+ab$	$-15b$	$+35abc$

The reason of this rule is derived from Definition and from the nature of multiplication, which is a repeated addition of one of the quantities to be multiplied as often as there are units in the other. Hence also the letters in two terms multiplied together may be placed in any order, and therefore the order of the alphabet is generally preferred.

### Case 2. To multiply compound quantities.

Rule. Multiply every term of the multiplier by all the terms of the multiplicand, and then add together, according to the preceding rules, the results.



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collect all the products into one sum, that sum is the product required

Example Mult  $2a + 3b$   $m + x$   
By  $3ax - 4by$   $m - x$

$$\begin{array}{r} 6a^2x + 9abx \\ - 8aby - 12b^2y \\ \hline \end{array} \quad \begin{array}{r} m^2 + mx \\ - mx - x^2 \\ \hline \end{array}$$

Prod  $6a^2x + 9abx - 8aby - 12b^2y$   $m^2 - x^2$

Mult  $a - b$

By  $c - d$

$$\begin{array}{r} ac - cb \\ - ad + db \\ \hline \end{array}$$

Prod  $ac - cb - ad + db$

*On the general Rule for the Signs* Multiplication is the finding a magnitude which has to the multiplicand, the proportion of the multiplier to unity. Hence, the multiplier must be an abstract number, and, if a simple term, can have neither + nor - prefixed to its notation. Now, 1st  $+a \times +m = +ma$  for the quality of  $a$  cannot be altered by increasing or diminishing its value in any proportion, therefore the product is of the quality *plus*, and  $ma$  by the definition is the product of  $a$  and  $m$  adly,  $-a \times +m = -ma$ , for the same reasons as before, *mutatis mutandis* 3dly,  $+a \times -m$ , has no meaning, for  $m$  must be an abstract number, therefore here we can have no proof. But  $+a \times (m - n) = ma - na$   $n$  being less than  $m$  for  $a$  taken as often as there are units in  $m$ , is  $ma$ , by the first case but  $a$  was to have been taken only as often as there are units in  $m - n$ , therefore  $a$  has been taken too often by the units in  $n$  consequently  $a$  taken  $n$  times, or  $na$ , must be subtracted, and of course  $ma - na$  is the true product. 4thly,  $-a \times (m - n) = -ma + na$  For,  $-a \times m = -ma$  (by case 2), but this, as above, is too great by  $-na$  therefore  $-ma$  with  $-na$  subtracted from it, is the true product but this by the rule of subtraction, is  $-ma + na$

## PROB IV To divide Quantities

Division is the converse of multiplication, and denotes, 1st, The finding a magnitude which has to the dividend the proportion of the divisor (an abstract number) to unity 2dly, The finding what abstract number has to unity the proportion of the dividend to an homogeneous magnitude, the divisor. The cases under which this rule is generally considered are the following

*Case 1* When the divisor and dividend are both simple quantities. Set the terms both down as in division of numbers, either the divisor before the dividend, or below it, like the denominator of a fraction. Then abbreviate these terms as much as can be done, by cancelling or striking out all the letters that are common to both of them, and also dividing the one coefficient by the other, or abbreviating them after the manner of a fraction, by dividing them by their common measure

*Note* Like signs in the two factors make + in the quotient; and unlike signs make -, the same as in multiplication.

Example 1. To divide  $8ab$  by  $2a$

Write  $8ab$   $2a$ , or  $2a$   $8ab$ , or  $\frac{8ab}{2a} = 4b$

Also  $a \div a = \frac{a}{a} = 1$ , and  $abc \div ab = \frac{abc}{ab} = c$

*Case 2.* When the dividend is a compound quantity and the divisor a simple one

Divide every term of the dividend by the divisor.

1  $(10ab + 15ax) \div 5a = \frac{10ab}{5a} + \frac{15ax}{5a} = 2b + 3x$

2  $(30ax - 48x) \div x = \frac{30ax}{x} - \frac{48x}{x} = 30a - 48$

3  $(10a^2x - 15x^2 - 5x) \div 5x = \frac{10a^2x}{5x} - \frac{15x^2}{5x} - \frac{5x}{5x} = 2a^2 - 3x - 1$

*Case 3* When the divisor and dividend are both compound quantities

1 Set them down as in common division of numbers, the divisor before the dividend, with a small crooked line between them, and ranging the terms according to the powers of some one of the letters in both, the higher powers of it before the lower

2 Divide the first term of the dividend by the first term of the divisor, as in the first case, and place the result in the quotient

3 Multiply the whole divisor by the term thus found, and subtract the result from the dividend.

4 To this remainder bring down as many terms of the dividend as are requisite for the next operation, dividing as before, and so on to the end, as in common arithmetic

*Note* If the divisor be not exactly contained in the dividend, the quantity which remains after the operation is finished may be placed over the divisor, like a vulgar fraction, and set down at the end of the quotient, as in common arithmetic

$$\begin{array}{r} x - 3 \overline{) x^3 - 9x^2 + 27x - 27} \quad (x^2 - 6x + 9 \\ \underline{x^3 - 3x^2} \phantom{+ 27x - 27} \\ - 6x^2 + 27x \phantom{- 27} \\ \underline{- 6x^2 + 18x} \phantom{- 27} \\ 9x - 27 \\ \underline{9x - 27} \\ 0 \end{array}$$

$$\begin{array}{r} - 6x^2 + 27x \\ - 6x^2 + 18x \\ \hline \end{array}$$

$$9x - 27$$

$$9x - 27$$

$$x - 3 \overline{) a^4 - x^3 (a^2 + ax + x^2} \\ \underline{a^4 - a^2x}$$

$$a^2x - x^3$$

$$a^2x - ax^2$$

$$ax^2 - x^3$$

$$ax^2 - x^3$$

## Another Example

$$a + x \overline{) as + xs (a - x + \frac{21x}{a} - \frac{21^2}{a^2} + \frac{21^3}{a^3} - \&c}$$

$$as + ax$$

$$- ax + xs$$

$$- ax + xs$$

$$+ 21x$$

$$+ 21x + \frac{21^2}{a}$$

$$+ 21x + \frac{21^2}{a}$$

$$- \frac{21^2}{a}$$

$$- \frac{21^2}{a}$$

$$- \frac{21^2}{a}$$

$$- \frac{21^2}{a}$$

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$$- \frac{21^2}{a}$$

$$- \frac{21^2}{a}$$

$$- \frac{21^2}{a}$$

In this last example the signs are alternately + and -, the coefficient is constantly 2 after the first two terms, and the letters are the successive powers of  $x$  and  $a$ , so that the quotient may in

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continued as far as you please without any more  
division

Divide  $10a^3 + 11a^2b - 19abc - 15a^2c + 3ab^2 + 15bc - 5bc$  by  $3ab + 5a^2 - 5b$ . Here we arrange the dividend and divisor with regard to the letter  $a$ , setting those terms of the dividend which contain like powers of  $a$  under one another then, on multiplying by each term of the quotient we put down the respective terms of each product with their signs changed, and add, as follows

Divisor,	$5a^2 + 3ab - 5bc$	Quotient
Dividend	$\begin{array}{r} 10a^3 + 11a^2b - 19abc + (2a + b - 3c) \\ 15bc^2 - 5b^2c - 15a^2c + 3ab^2 \\ - 10a^3 - 6a^2b + 10abc \end{array}$	
1st Rem	$\begin{array}{r} 5a^2b - 9abc + 15bc^2 - 5b^2c \\ - 15a^2c + 3ab^2 \\ - 5a^2b - 3ab^2 + 51bc \end{array}$	
2d Rem	$\begin{array}{r} - 15a^2c - 9abc + 15bc^2 \\ + 15a^2c + 9abc - 15bc^2 \end{array}$	

## SECT II *Algebraic Fractions*

Algebraic fractions have the same names and rules of operations as vulgar fractions in common arithmetic

**PROB I** *To reduce a mixed Quantity to an improper Fraction*

**Rule** Multiply the integer by the denominator of the fraction, and to the product add the numerator, then the denominator being placed under this sum, will give the improper fraction required

1. Reduce  $3\frac{1}{2}$ , and  $a - \frac{b}{c}$  to improper fractions

First,  $3\frac{5}{7} = \frac{3 \times 7 + 5}{7} = \frac{21 + 5}{7} = \frac{26}{7}$  Ans

$$\text{And, } a - \frac{b}{c} = \frac{a \times c - b}{c} = \frac{ac - b}{c} \quad \text{Ans}$$

2 Reduce  $x + \frac{x^2}{a}$  and  $x - \frac{a^2 - x^2}{x}$  to improper fractions.

First,  $x + \frac{x^2}{a} = \frac{x \times a + x^2}{a} = \frac{ax + x^2}{a}$  the Ans

And,  $x - \frac{a^2 - x^2}{x} = \frac{x^2 - a^2 + x^2}{x} = \frac{2x^2 - a^2}{x}$  Ans

**PROB II** *To reduce an improper Fraction to a whole or mixed Quantity*

**Rule** Divide the numerator by the denominator, for the integral part, and place the remainder, if any, over the denominator, for the fractional part, the two joined together will be the mixed quantity required

1. Reduce  $\frac{ax+a^2}{x}$ ,  $\frac{ab-a^2}{b}$ , to mixed quantities

Thus,  $\frac{ax + a^2}{x} = \frac{ax}{x} + \frac{a^2}{x} = a + \frac{a^2}{x}$

And  $\frac{ab-a^2}{b} = \frac{ab}{b} - \frac{a^2}{b} = a - \frac{a^2}{b}$

**PROB III** *To reduce Fractions to a common Denominator*

**Rule** Multiply each numerator into all the denominators except its own for a respective new numerator, and all the denominators together, for a common denominator

Reduce  $\frac{2}{3}$ ,  $\frac{5}{4}$ , and  $\frac{7}{5}$  to fractions having a common denominator

$$\left. \begin{array}{l} a \times d \times f = adf \\ c \times b \times f = cbf \\ b \times d \times e = bde \end{array} \right\} \begin{array}{l} \text{the numerators} \\ \hline \text{the com denom} \end{array}$$

Therefore,  $\frac{adf}{bdf}, \frac{cbf}{bdf}, \frac{bde}{bdf}$ , are the fractions re-  
quired

In like manner,  $\frac{a}{b}$ , and  $\frac{a+b}{c}$ , when reduced

to a common denominator, become  $\frac{ac}{bc}$ , and

PROB IV *To find the greatest common Measure of the Terms of a Fraction*

**Rule 1** Range the quantities according to the dimensions of some letters, as is shown in division

5 Divide the greater term by the less, and the last divisor by the last remainder, and so on till nothing remains, then the divisor last used will be the common measure required.

*Note* All the letters or figures which are common to each term of the divisors, must be thrown out of them, before they are used in the operation.

To find the greatest common measure of  $x^3 - b^2x$

$$\begin{array}{r} x^2 + 2bx + b^2 \\ x^2 + 2bx + b^2 \end{array} \quad \begin{array}{r} x^3 - b^2x \\ x^3 + 2bx^2 + b^2x \end{array}$$


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$$\begin{array}{r} -2bx^2 - 2b^2x \\ \text{or } x + b \end{array} \quad \begin{array}{r} x^2 + 2b \\ x^2 + 2bx + b^2 \end{array} \quad \begin{array}{r} x + b \\ x^2 + bx \end{array}$$


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$$\begin{array}{r} bx + b^2 \\ bx + b^2 \end{array}$$

Therefore  $x + b$  is the greatest common divisor

**PROB V** *To reduce a Fraction to its lowest Terms*

**Rule 1** Find the greatest common measure, as in the last problem

2 Divide both the terms of the fraction by the common measure thus found, and it will reduce it to its lowest terms, as was required

3 Or divide the terms both by any quantity that it may appear will divide them both

### Examples

1. Reduce  $\frac{cx+x^2}{cx^2+bx}$  to its lowest terms

ce  $\frac{cx+x^2}{ca^3+a^2x}$  to its lowest  
 or  $c+x$   $\left. \begin{array}{l} cx+x^2 \\ ca^3+a^2x \end{array} \right\} \begin{array}{l} ca^2+a^2x \\ ca^3+a^2x \end{array} (a^2$

Here  $ca + x^2$  is divided by  $x$  which is common to both terms

Therefore  $c \div x$  is the greatest common measure,

and  $c+x) \frac{cx + x^2}{ca^2 + a^2x} = \frac{x}{a^2}$  is the fraction required.

**PROB VI** *To add Algebraic Fractions together, or to subtract them one from another*

**Rule** Reduce them to a common denominator, then add or subtract the numerators; and the sum or difference set over the common denominator is the sum or remainder required

**Example** Add together  $\frac{a}{b}$ ,  $\frac{c}{d}$ ,  $\frac{e}{f}$ ; the sum is

$$\frac{adf + cbf + bdc}{bdf}$$

From  $\frac{a}{b}$  sub  $\frac{c}{d}$  the difference is  $\frac{ad-bc}{bd}$



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**COR 1** Integers and fractions may be added and subtracted by this rule, by considering unity as the denominator of the integers

Thus,  $b + \frac{c}{d} = \frac{bd+c}{d}$  and  $a - \frac{a^2-b^2}{2a} - \frac{2a^2-a^2-b^2}{2a} = \frac{a^2+b^2}{2a}$

**COR 2** A fraction, whose numerator is a compound quantity, may be distinguished into parts by dividing the numerator into several parts, and setting each over the common denominator, and uniting the new fractions by the signs of their numerators

Thus,  $\frac{a^2-2ab+b^2}{2a} = \frac{a^2}{2a} - \frac{2ab}{2a} + \frac{b^2}{2a} = \frac{a}{2} - b + \frac{b^2}{2a}$

Add together  $1, \frac{x}{a}, \frac{x^2}{a^2}, \frac{x^3}{a^3}$ , and  $\frac{x^4}{a^4-1}$

The quantities reduced to the denominator  $a^4-1$  are  $\frac{a^4-1}{a^4-1}, \frac{a^3x-a^3x}{a^4-1}, \frac{a^2x^2-a^2x^2}{a^4-1}, \frac{ax^3-ax^3}{a^4-1}, \frac{x^4}{a^4-1}$  where the numerators annihilate each other's last and first terms throughout except the first term  $a^4$  therefore the sum is  $\frac{a^4}{a^4-1}$ , or in its lowest terms  $\frac{a}{a-1}$

**PROB VII** To multiply fractions

**Rule** Multiply the numerators into one another for the numerator of the product, and the denominators into one another, for the denominator of the product

Example  $\frac{1}{b} \times \frac{c}{d} = \frac{ac}{bd}$   $\frac{a+b}{c} \times \frac{a-b}{d} = \frac{a^2-b^2}{cd}$

**Proof** Let  $\frac{a}{b} = m$ , and  $\frac{c}{d} = n$  Then  $a = bm$ , and  $c = dn$ , and  $ac = bdm$  and  $(mn) = \frac{a}{b} \times \frac{c}{d} = \frac{ac}{bd}$

Multiply  $\frac{1}{c}, \frac{1}{c},$  and  $\frac{1}{2b}$  together  $\frac{1}{a} \times \frac{1}{c} \times \frac{1}{2b} = \frac{1}{1} \times \frac{1}{2bc} = \frac{1}{2bc}$

**PROB VIII** To divide Fractions

**Rule** Multiply the numerator of the dividend by the denominator of the divisor for a new numerator and the denominator of the dividend by the numerator of the divisor, for a new denominator

Thus,  $\left(\frac{a}{b}\right) \div \left(\frac{c}{d}\right) = \left(\frac{ad}{bc}\right)$

**Proof** Let  $\frac{a}{b} = m$ , and  $\frac{c}{d} = n$ , then  $a = bm$ , and  $c = dn$ , also  $ad = bdm$  and  $bc = bdn$  therefore  $\left(\frac{ad}{bc}\right) = \frac{bdm}{bdn} = \frac{m}{n} = \frac{a}{b} \div \frac{c}{d}$

Find the quotient of  $\frac{2x^2}{x^3+a^3}$  divided by  $\frac{x}{x+a}$   $\frac{2x^2}{x^3+a^3} \times \frac{x+a}{x} = \frac{2x^2 \times (x+a)}{(x^3+a^3) \times x} = \frac{2x}{x^2+ax+a^2}$  is the quotient required

Again,  $\frac{x^4-b^4}{x^2-2bx+b^2} = \frac{x^2+bx}{x-b} = \frac{x^4-b^4}{(x-b)^2} \times \frac{x-b}{x-b} = \frac{x^4-b^4}{x(x+b)(x-b)} = \frac{x^4-b^4}{x(x^2-b^2)} = \frac{x^2+bx}{x} = x + \frac{b}{x}$

**DEFINITION III** Of the Evolution of Quantities

The products arising from the continual multiplication of the same quantity, were before called the powers of that quantity. Thus,  $a, a^2, a^3, a^4$  &c are the powers of  $a$  and  $ab, a^2b, a^3b, a^4b$ , &c are the powers of  $ab$ . And the rule given for the multiplication of powers of the same quantity is to 'Add the exponents, and make their sum the exponent of the product'. Thus  $a^4 \times a^5 = a^9$ , and  $a^{1/3} \times a^{1/2} = a^{5/6}$ . For dividing powers of the same quantity the rule is 'To subtract the exponents, and make the difference the exponent of the quotient'.

Thus,  $\frac{a^6}{a^4} = a^{6-4} = a^2$ , and  $\frac{a^{1/3}}{a^{1/6}} = a^{1/3-1/6} = a^{1/6}$

If you divide a less power by a greater, the exponent of the quotient must, by this rule, be negative. Thus,  $\frac{a^4}{a^6} = a^{4-6} = a^{-2}$ . But  $\frac{1}{a^2} = a^{-2}$

and hence  $\frac{1}{a^2}$  is expressed also by  $a^2$  with a negative exponent, or  $a^{-2}$

It is also obvious that  $\frac{a}{a} = a^{1-1} = a^0$ , but  $\frac{a}{a} = 1$ , and therefore  $a^0 = 1$ . After the same manner,  $\frac{1}{a} = \frac{a^0}{a} = a^{0-1} = a^{-1}$ ,  $\frac{1}{a^2} = \frac{a^0}{a^2} = a^{0-2} = a^{-2}$ ,  $\frac{1}{a^3} = \frac{a^0}{a^3} = a^{0-3} = a^{-3}$ , so that the quantities  $a, \frac{1}{a}, \frac{1}{a^2}, \frac{1}{a^3}, \frac{1}{a^4}$ , &c may be expressed thus  $a^1, a^0, a^{-1}, a^{-2}, a^{-3}, a^{-4}$ , &c. Those are called the negative powers of  $a$  which have negative exponents, but they are at the same time positive powers of  $\frac{1}{a}$ , or  $a^{-1}$ .

Negative powers (as well as positive) are multiplied by adding and divided by subtracting their exponents. Thus the product of  $a^{-2}$  (or  $\frac{1}{a^2}$ ) multiplied by  $a^{-3}$  (or  $\frac{1}{a^3}$ ) is  $a^{-2-3} = a^{-5}$  (or  $\frac{1}{a^5}$ ), also  $a^{-2} \times a^{-4} = a^{-6}$  (or  $\frac{1}{a^6}$ ), and  $a^{-2} \div a^{-3} = a^{-2+3} = a^1$ . And, in general, any positive power of  $a$  multiplied by a negative power of  $a$  of an equal exponent, gives unit for the product, 'or the positive and negative exponents destroy each other, and the product gives  $a^0$ , which is equal to unit'.

Likewise  $\frac{a^{-5}}{a^{-3}} = a^{-5+3} = a^{-2} = \frac{1}{a^2}$ , and  $\frac{a^{-3}}{a^{-5}} = a^{-3+5} = a^2$ . But also,  $\frac{a^{-3}}{a^{-5}} = \frac{a^{-3}}{a^{-3} \times a^{-2}} = \frac{1}{a^{-2}}$ , therefore  $\frac{1}{a^{-2}} = a^2$ . And, in general, 'any quantity placed in the denominator of a fraction, may be transposed to the numerator, if the sign of its exponent be changed'. Thus  $\frac{1}{a^3} = a^{-3}$ , and  $\frac{1}{a^{-3}} = a^3$

The quantity  $a^m$  expresses any power of  $a$

# A L G E B R A

general, the exponent ( $m$ ) being undetermined, and  $a^{-m}$  expresses  $\frac{1}{a^m}$ , or a negative power of  $a$  of an equal exponent and  $a^n \times a^{-m} = a^{n-m} = a^0 = 1$  is their product  $a^n$  expresses any other power

of  $a$ ,  $a^m \times a^n = a^{m+n}$  is the product of the powers of  $a^m$  and  $a^n$ , and  $a^m \div a^n = a^{m-n}$  is their quotient

To raise any simple quantity to its second third, or fourth power, is to add its exponent twice, thrice or four times to itself, therefore the second power of any quantity is had by doubling its exponent and the third by tripling its exponent, and in general, the power expressed by  $m$  of any quantity is had by multiplying the exponent by  $m$ , as is obvious from the multiplicative powers. Thus the second power or square of  $a$

is  $a^1 \times^1 = a^2$  its third power or cube is  $a^3 \times^1 = a^3$ , and the  $m$ th power of  $a$  is  $a^m \times^1 = a^m$  Also,

the square of  $a^4$  is  $a^4 \times a^4 = a^8$ , the cube of  $a^4$  is  $a^4 \times a^4 \times a^4 = a^{12}$ , and the  $m$ th power of  $a^4$  is  $a^{4 \times m}$ . The square of  $ab$  is  $a^2b^2$ , the cube is  $a^3b^3$ , the  $m$ th power is  $a^mb^m$ .

The raising of quantities to any power is called Involution, and any simple quantity is involved by multiplying the exponent by that of the power required, as in the preceding examples.

The coefficient must also be raised to the same power by a continual multiplication of itself by itself, is often a unit is contained in the exponent of the power required. Thus the cube of  $3ab$  is  $3 \times 3 \times 3 \times a^3 b^3$   $27a^3b^3$

As to the sign, When the quantity to be involved is positive it is obvious that all its powers must be positive. And when the quantity to be involved is negative, yet all its powers whose exponents are even numbers must be positive for any number of multiplications of a negative, if the number is even give a positive.

The power, then, only can be negative when its exponent is an odd number, though the quantity to be involved be negative. The power of  $-a$  are  $-a$ ,  $+a^2$ ,  $-a^3$ ,  $+a^4$   $-a^5$  &c. Those whose exponents are 2, 4, 6, &c. are positive, but those whose exponents are 1, 3, 5, &c. are negative.

The involution of compound quantities is a more difficult operation. The powers of any binomial  $a+b$  are found by a continual multiplication of it into itself, as follows:

$$a + b = \text{Root}$$

$\lambda a + l$

$$a^2 \vdash ab$$

$$+ a^2 + b^2$$

$$a^2 + -av + b^2 = \text{the Square, or 2d Power}$$

$a + b$

$$a^2 + 2ab + b^2$$

$$+ a^2 l + 2 a l^2 + l^3$$

$$a^3 + 3a^2b + 3ab^2 + b^3 = \text{Cubic, or 3d Power}$$

$$x^2 + 3x + 2$$

$$-4 \div 2 = -2 \quad 1 \div 2 = 1/2 \quad 2 \div 2 = 1 \quad 3 \div 2 = 1.5$$

$$+ a^3l + 3a^2b^2 + 3a^2l^2 + 3a^2b^2 + 3a^2l^2 + 3a^2b^2 + 3a^2l^2$$

$$a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4 = \text{Binomial etc}$$

If the powers of  $a-b$  are required, they will be found the same as the preceding, only the terms in which the exponent of  $b$  is an odd number will be found negative, "because in odd number of multiplications of a negative produces a negative." Thus, the cube of  $a-b$  will be found to be  $a^3 -$

$3a^2b + 3ab^3 - b^3$ , where the 2d and 4th terms are negative, the exponent of  $b$  being an odd number in these terms. In general, the terms of any power of  $a-b$  are positive and negative alternately.

Sir Isaac Newton's Rule for finding a Binomial or  
Residual Quantity to any Power whatever

1 To find the  $T$ 's without the Coefficients. The index of the first or leading quantity, begins with that of the given power and decreases continually by 1, in every term to the last, and in the following quantity, the indices of the terms are 0, 1, 2, 3 4 &c \*

2 To find the Coefficients. The first is always 1, and the second is the index of the power; and in general, if the coefficient of any term be multiplied by the index of the leading quantity, and the product be divided by the number of terms to that place, it will give the coefficient of the term next following.

*Note.* The whole number of terms will be one more than the index of the given power, and when both terms of the root are +, all the terms of the power will be + but if the second term be -, all the odd terms will be +, and the even terms —

This rule expressed in general terms, is as follows

$$\overline{a+b}^1 = a_n + n a^{n-1} + b_n \frac{n-1}{2} a_1^{-2} b^2 + n \frac{n-1}{2}$$

$$\frac{n-2}{3} \quad n-3 \quad \omega, \&c$$

$$a-b^n = a^n - n a^{n-1} b + n \frac{n-1}{2} a^{n-2} b^2 - n \frac{n-1}{2} \frac{n-2}{3} \dots$$

$a_n = 3/3, \&c$

The sum of the coefficients, in every power, is equal to the number 2 raised to that power. Thus  $1 + 1 = 2$  for the first power,  $1 + 2 + 1 = 4 = 2^2$  for the square,  $1 + 3 + 3 + 1 = 8 = 2^3$  for the cube or third power, and so on.

But if the coefficients be taken *plus* and *minus* alternately, the sum of the coefficients is nothing  
 SEC. BINOM. VI

Let  $x = r$  be involved to the 6th power. The terms without the coefficients will be

$$x^6, x^5, x^4, x^3, x^2, x, 1$$

and the coefficients will be

$$1, 6, \frac{6 \times 5}{2}, \frac{15 \times 4}{3}, \frac{20 \times 3}{4}, \frac{15 \times 2}{5}, \frac{6 \times 1}{6},$$

01 1,6 15, 20 15 6, 1

And therefore the 6th power of  $\sqrt{-a}$  is

$$x^6 - 6x^5a + 15x^4a^2 - 20x^3a^3 + 15x^2a^4 - 6xa^5 + a^6$$

If a quantity consisting of three or more terms is to be involved, you may distinguish it into two parts considering it as a monomial, and raise it to any power by the preceding rule, and then by the same rules you may substitute instead of the powers of the compound parts their values. Thus,

$$\begin{aligned} a+b+c-a+b+i^2 &= a + \frac{1}{2} \times a+b+c^2 - a^2 + \\ \frac{2ib+b^2}{2} + \frac{2ic+c^2}{2} \text{ And } i^4 b^2 i^2 &= a + i^3 + 3c \times \\ \frac{a+i}{3} + 3 \frac{1}{2} \times a+b+i^2 - i^3 + 3a^2 b^2 + 3ab^2 + b^3 + 3 \frac{1}{2} + \\ 6abc + 3b^2 c + 3c^2 + 3i^2 + 1 \end{aligned}$$

In these examples,  $a+b+c$ , is considered as composed of the compound part  $a+b$  and the simple part  $c$ , and then the powers of  $a+b+c$  are formed by the preceding rules :

Of *I* *don't* on The reverse o' Involution, or the  
re-olving of powers into their roots is c'ld I-vo-  
lution The roots of single quantities are easily

# ALGEBRA

extracted by dividing their exponents by the number that denominates the root required. Thus, the square root of  $a^6$  is  $a^3 = a^4$ , and the square root of  $a^4 b^2 c^2$  is  $a^2 b c$ . The cube root of  $a^6 b^3 c^3$  is  $a^2 b c$ , and the cube root of  $a^9 b^6 c^3$  is  $a^3 b^2 c$ . The ground of this rule is obvious from the rule for involution. The powers of any root are found by multiplying its exponent by the index that denominates the power, and therefore, when any power is given, the root must be found by dividing the exponent of the given power by the number that denominates the kind of root that is required.

It appears from what was said of Involution, that any power that has a positive sign may have either a positive or negative root, if the root is denominated by any even number. Thus the square root of  $+a^2$  may be  $+a$ , or  $-a$ , because  $+a \times +a$ , or  $-a \times -a$  gives  $+a^2$  for the product.

But if a power have a negative sign, "no root of it denominated by an even number can be assigned" since there is no quantity that multiplied into itself an even number of times can give a negative product. Thus the square root of  $-a^2$  cannot be assigned, and is what we call an "impossible or imaginary quantity."

But if the root to be extracted is denominated by an odd number, then shall the sign of the root be the same as the sign of the given number whose root is required. Thus the cube root of  $-a^3$  is  $-a$ , and the cube root of  $+a^3$  is  $+a$ .

If the number that denominates the root required be a divisor of the exponent of the given power, then shall the root be only a lower power of the same quantity. As the cube root of  $a^{12}$  is  $a^4$ , the number 3 that denominates the cube root being a divisor of 12.

But if the number that denominates what sort of root be required be not a divisor of the exponent of the given power, "then the root required shall have a fraction for its exponent." Thus the square root of  $a^3$  is  $a^{\frac{3}{2}}$ , the cube root of  $a^4$  is  $a^{\frac{4}{3}}$ , and the square root of  $a$  itself is  $a^{\frac{1}{2}}$ .

To find the Square Root of a Compound Quantity proceed exactly as in common arithmetic. Thus,

$$\begin{array}{r} \text{Extract the square root of } x^4 - 4x^3 + 6x^2 - 4x + 1 \\ x^4 - 4x^3 + 6x^2 - 4x + 1 \quad \{ x^2 - 2x + 1 = \text{root} \end{array}$$

$$\begin{array}{r} 2x^2 - 4x + 1 \\ -4x^3 + 6x^2 \\ \hline \end{array}$$

$$\begin{array}{r} 2x^2 - 4x + 1 \\ 2x^2 - 4x + 1 \\ \hline \end{array}$$

To find the Roots of Powers in general

**Rule 1.** Find the root of the first term, and place it in the quotient.

2. Subtract its power from that term, and bring down the second term for a dividend.

3. Involve the root, last found, to the next lowest power, and multiply it by the index of the given power for a divisor.

4. Divide the dividend by the divisor, and the quotient will be the next term of the root.

5. Involve the whole root, and subtract and divide as before, and so on till the whole is required.

Extract the cube root of  $x^6 + 6x^5 + 12x^4 + 8x^3$

$$\begin{array}{r} -64, \\ x^6 + 6x^5 + 12x^4 + 8x^3 - 64(x^3 + 2x - 4) \\ \hline 3x^4 + 16x \\ x^6 + 6x^5 + 12x^4 + 8x^3 \\ \hline 3x^4 - 12x^4 \\ \hline x^6 + 6x^5 - 40x^4 + 96x^3 - 64 \end{array}$$

By the same rule the square root of  $a^4 - x^2$ , found to be  $a - \frac{x^2}{2a} - \frac{x^4}{2 \cdot 4a^3} - \frac{3x^6}{2 \cdot 4 \cdot 6a^5}$ , &c an infinite series whose law of continuation is manifest.

So also the cube root of  $1 - x^3$ , is  $1 - \frac{x^3}{3} - \frac{x^6}{9} - \frac{5x^9}{27} - \frac{5x^{12}}{81} - \frac{31x^{15}}{243} - \frac{43x^{18}}{729} - \frac{143x^{21}}{6561} - \frac{169x^{24}}{531441} - \frac{2801x^{27}}{531441} - \frac{845x^{30}}{531441} - \frac{4213x^{33}}{531441} - \frac{1063x^{36}}{531441} - \frac{1063x^{39}}{531441} - \frac{1063x^{42}}{531441} - \frac{1063x^{45}}{531441} - \frac{1063x^{48}}{531441} - \frac{1063x^{51}}{531441} - \frac{1063x^{54}}{531441} - \frac{1063x^{57}}{531441} - \frac{1063x^{60}}{531441} - \frac{1063x^{63}}{531441} - \frac{1063x^{66}}{531441} - \frac{1063x^{69}}{531441} - \frac{1063x^{72}}{531441} - \frac{1063x^{75}}{531441} - \frac{1063x^{78}}{531441} - \frac{1063x^{81}}{531441} - \frac{1063x^{84}}{531441} - \frac{1063x^{87}}{531441} - \frac{1063x^{90}}{531441} - \frac{1063x^{93}}{531441} - \frac{1063x^{96}}{531441} - \frac{1063x^{99}}{531441} - \frac{1063x^{102}}{531441} - \frac{1063x^{105}}{531441} - \frac{1063x^{108}}{531441} - 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# ALGEBRA.

which by restoring the values of A, B, C, D, becomes  $\frac{1}{a^2} - \frac{2b}{a^3} + \frac{3b^2}{a^4} - \frac{4b^3}{a^5} + \frac{5b^4}{a^6}$ , &c the series required

See SERIES

## SECT. IV. SURDS

Surds, or irrational quantities, are such as have no exact root, but are usually denoted by means of the sign of radicality ( $\sqrt{\phantom{x}}$ ) placed before them. Thus  $\sqrt{5}$ , or  $5^{\frac{1}{2}}$  is a surd, being the square root of 5

$\sqrt[3]{7}$ , or  $7^{\frac{1}{3}}$  cube root of 7, is a surd

$a^{\frac{1}{2}}$ , or  $\sqrt{a}$  is a surd, at least, when  $a$  is not a cube number

The most useful problems relating to surds, are the following

PROB I To Reduce a Rational Quantity to the Form of a Surd

**Rule** Raise the quantity to a power equivalent to that denoted by the index of the surd, then over this new quantity place the radical sign, and it will be of the form required

Thus, 1 To reduce 3 to the form of the square root

First  $3 \times 3 = 3^2 = 9$ , whence  $\sqrt{9}$  is the answer

2 To reduce  $2x^3$  to the form of the cube root

First,  $2x^3 \times 2x^3 \times 2x^3 = (2x^3)^3 = 8x^9$ , whence  $\sqrt[3]{8x^9}$  or  $(8x^9)^{\frac{1}{3}}$  the answer

A rational quantity may be put into the form of a surd, by reducing its index to the form of a fraction of the same value

Thus,  $a = a^{\frac{2}{2}} = \sqrt{a^2}$

$a^{\frac{1}{2}}b = a^{\frac{1}{2}}b^{\frac{1}{2}} = \sqrt[2]{a^1b^1}$

PROB II To Reduce Quantities of different Indices, to other equivalent ones, that shall have a common Index

**Rule** 1 Divide the indices of the quantities by the given index, and the quotients will be the new indices for those quantities

2 Over the said quantities, with their new indices, place the given index, and they will make the equivalent quantities required

3 A common index may also be found by reducing the indices of the quantities to a common denominator, and involving each of them to the power denoted by its numerator

1 Reduce  $15^{\frac{1}{2}}$  and  $9^{\frac{1}{3}}$  to equivalent quantities having the common index  $\frac{1}{6}$

$\frac{1}{2} = \frac{3}{6} \times \frac{1}{3} = \frac{1}{3}$  the 1st index

$\frac{1}{3} = \frac{2}{6} \times \frac{1}{2} = \frac{1}{3}$  the 2d index

Therefore  $(15^{\frac{1}{2}})^{\frac{1}{3}} = 15^{\frac{1}{6}}$  and  $(9^{\frac{1}{3}})^{\frac{1}{2}} = 9^{\frac{1}{6}}$  are the quantities required

2 Reduce  $a^2$  and  $x^{\frac{1}{2}}$  to the same common index

$\frac{1}{2} = \frac{1}{2} \times \frac{1}{1} = \frac{1}{2}$  the 1st index

$\frac{1}{1} = \frac{2}{2} \times \frac{1}{2} = \frac{1}{1}$  the 2d index

PROB III To reduce Surds to their most simple Terms

**Rule** 1 Divide the given surd into factors, one of which at least is a complete power, set the root of this factor before the other factor or factors, with the radical sign between them

2 When the surd is a fraction whose denominator is not a complete power, multiply both numerator and denominator by such a number as will make the denominator a complete power. Then proceed as above.

1 Reduce  $\sqrt[3]{108}$  to its simplest terms

$\sqrt[3]{108} = \sqrt[3]{27 \times 4} = \sqrt[3]{27} \times \sqrt[3]{4} = 3 \times \sqrt[3]{4} = 3\sqrt[3]{4}$

2 Reduce  $\sqrt[3]{\frac{50}{147}}$  to its simplest terms

$$\sqrt[3]{\frac{50}{147}} = \sqrt[3]{\frac{50}{147} \times \frac{3}{3}} = \sqrt[3]{\frac{25 \times 2}{441}} = \frac{5}{21} \sqrt[3]{6}$$

3 Reduce  $\sqrt[3]{\frac{2}{11}}$  to its simplest terms

$$\sqrt[3]{\frac{2}{11}} = \sqrt[3]{\frac{2}{11} \times \frac{2}{2}} = \sqrt[3]{\frac{4}{22}} = \sqrt[3]{\frac{2}{11}}$$

Fractions that contain either a binomial or residual surd, in the denominator, may commonly be simplified by multiplying both numerator and denominator by a number containing the same surds as the denominator, but connected by a different sign

$$\text{Thus, } \frac{\sqrt{20} + \sqrt{12}}{\sqrt{5} - \sqrt{3}} = \frac{\sqrt{20} + \sqrt{12}}{\sqrt{5} - \sqrt{3}} \times \frac{\sqrt{5} + \sqrt{3}}{\sqrt{5} + \sqrt{3}} =$$

$$\frac{16 + 2\sqrt{60}}{5 - 3} = \frac{16 + 2\sqrt{4 \times 15}}{2} = \frac{16 + 4\sqrt{15}}{2} = 8 + 2\sqrt{15}$$

PROB IV To add and Subtract Surd Quantities together

**Rule** 1 Reduce such quantities as have unlike indices to other equivalent ones, having a common index

2 Bring all fractions to a common denominator, and reduce the quantities to their simplest terms, as in the last problem

3 Then, if the surd part be the same in them all, annex it to the sum of the rational parts, with the sign of multiplication, and it will give the total sum required

But if the surd part be not the same in all the quantities, they can only be added by the signs + and -

1 It is required to add  $\sqrt{27}$  and  $\sqrt{48}$  together

First,  $\sqrt{27} = \sqrt{9 \times 3} = 3\sqrt{3}$ , and  $\sqrt{48} = \sqrt{16 \times 3} = 4\sqrt{3}$ , whence,  $3\sqrt{3} + 4\sqrt{3} = (3+4)\sqrt{3} = 7\sqrt{3}$  = sum required

2 Add together  $2\sqrt[3]{a^3b}$  and  $3\sqrt[3]{64b^3}$

$2\sqrt[3]{a^3b} = 2\sqrt[3]{a^3} \times \sqrt[3]{b} = 2a\sqrt[3]{b}$

$3\sqrt[3]{64b^3} = 3\sqrt[3]{64} \times \sqrt[3]{b} = 24\sqrt[3]{b}$

1 therefore,  $2a\sqrt[3]{b} + 24\sqrt[3]{b} = (2a + 24)\sqrt[3]{b}$ , the sum

PROB V To find the Difference of Surd Quantities

**Rule** Prepare the quantities as in the last rule, and the difference of the rational parts annexed to the common surd, will give the difference of the surds required

But if the quantities have no common surd they can only be subtracted by means of the sign -

1 Required to find the difference of  $\sqrt{448}$  and  $\sqrt{112}$

First,  $\sqrt{448} = \sqrt{64 \times 7} = 8\sqrt{7}$ , and  $\sqrt{112} = \sqrt{16 \times 7} = 4\sqrt{7}$

Whence  $8\sqrt{7} - 4\sqrt{7} = 4\sqrt{7}$  the difference required

2 Find the difference of  $8\sqrt[3]{a^2b}$  and  $3\sqrt[3]{a^6b}$

$8\sqrt[3]{a^2b} = 8\sqrt[3]{a^2} \times \sqrt[3]{b} = 2a^{\frac{2}{3}}\sqrt[3]{b}$

Therefore the difference is  $(8a^{\frac{2}{3}} - 2a^{\frac{2}{3}})\sqrt[3]{b}$

PROB VI To Multiply Surd Quantities together

**Rule** Reduce the surds to the same index, next multiply the rational quantities together, and the surds together, then the one product annexed to the other will give the whole product required, which may be reduced to its most simple terms by Problem III

1 Find the product of  $\frac{1}{2}\sqrt[3]{2}$  and  $\frac{1}{3}\sqrt[3]{3}$

Here  $\frac{1}{2} \times \frac{1}{3} \times \sqrt[3]{2} \times \sqrt[3]{3} = \frac{1}{6}\sqrt[3]{2 \times 3} = \frac{1}{6}\sqrt[3]{6} = \frac{1}{6}\sqrt[3]{2 \times 3} = \frac{1}{6}\sqrt[3]{2} \times \sqrt[3]{3}$

2 The product of  $2\sqrt[3]{\frac{1}{4}}$  into  $\frac{1}{3}\sqrt[3]{\frac{1}{10}}$  is equal to

$$\frac{2}{3} \sqrt[3]{\frac{1}{40}} = \frac{2}{3} \sqrt[3]{\frac{1}{2^3 \times 5}} = \frac{2}{3} \times \frac{1}{2} \sqrt[3]{\frac{1}{5}} = \frac{1}{3} \sqrt[3]{\frac{1}{5}}$$

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3 The product of  $(x+y)^{\frac{1}{2}}$  into  $(x+y)^{\frac{1}{2}}$ , is  $(x+y)^{\frac{1}{2}+\frac{1}{2}} = (x+y)^1 = (x+y)$

**PROB. VII To Divide one Surd Quantity by another**

**Rule** Reduce the surds to the same index, then take the quotient of the rational quantities, and annex it to the quotient of the surds, and it will give the whole quotient required, which may be reduced to its most simple terms as before

1 It is required to divide  $8\sqrt{100}$  by  $2\sqrt{6}$   
 $\frac{8\sqrt{100}}{2\sqrt{6}} = \frac{4\sqrt{100}}{\sqrt{6}} = 4\sqrt{18} = 4\sqrt{9 \times 2} = 4 \times 3\sqrt{2} = 12\sqrt{2}$ , the quotient required

2 Divide  $3\sqrt{a^2b-b^2}$  by  $3\sqrt{b}$   
 $\frac{3\sqrt{a^2b-b^2}}{3\sqrt{b}} = \sqrt{\frac{a^2b-b^2}{b}} = \sqrt{a^2-\frac{b^2}{b}} = \sqrt{a^2-\frac{b}{1}} = \sqrt{a^2-b}$

3 Divide  $(x+y)^{\frac{1}{2}}$  by  $(x+y)^{\frac{1}{3}}$   
 $(x+y)^{\frac{1}{2}} \div (x+y)^{\frac{1}{3}} = (x+y)^{\frac{1}{2}-\frac{1}{3}} = (x+y)^{\frac{1}{6}} = (x+y)^{\frac{1}{6}}$

**PROB. VIII To Involue or raise Surd Quantities to any Power**

**Rule** Multiply the index of the quantity by the index of the power to which it is to be raised, and to the result annex the power of the rational parts, and it will give the power required

1 Find the cube of  $\frac{1}{2}\sqrt{7}$

First,  $\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8}$ , and  $(\sqrt{7})^3 = 7^{\frac{3}{2}} = (343)^{\frac{1}{2}}$   
 Therefore  $\frac{1}{8}\sqrt{343}$  is the cube

2 Find the 4th power of  $\frac{1}{3}\sqrt{6}$

Fourth power of  $\frac{1}{3}\sqrt{6}$  is  $\frac{1}{3^4} \times 6^2 = \frac{1}{81} \times 36 = \frac{4}{9}$   
 Therefore  $\frac{1}{9}\sqrt{6}$  is the 4th power required

3 Find the square of  $a-\sqrt{b}$   
 Here  $(a-\sqrt{b}) \times (a-\sqrt{b}) = a^2 - 2a\sqrt{b} + b$ , the square required

**PROB. IX To Extract the Roots of Surd Quantities**

**Rule** Divide the index of the given quantity by the index of the root to be extracted, then to the result annex the root of the rational part, and it will give the root required

1 It is required to find the square root of  $9\sqrt{3}$

First,  $\sqrt{9} = 3$ , and  $(\sqrt{3})^2 = 3$ , therefore  $3\sqrt{3}$  is the square root required

2 Find the  $n$ th root of  $(x+y)^{\frac{n}{m}}$

Here  $\sqrt[n]{(x+y)^{\frac{n}{m}}} = (x+y)^{\frac{1}{m}} = \sqrt[m]{x+y}$

3 The square root of a binomial or residual surd  $A \pm \sqrt{B}$ , or  $A - \sqrt{B}$ , may be found thus Take  $\sqrt{A^2 - B} = D$ ,

then  $\sqrt{A+B} = \sqrt{\frac{A+D}{2}} + \sqrt{\frac{A-D}{2}}$ ,

and  $\sqrt{A-B} = \sqrt{\frac{A+D}{2}} - \sqrt{\frac{A-D}{2}}$

Thus, the square root of  $8+2\sqrt{7} = 1+\sqrt{7}$

and the square root of  $3-\sqrt{8} = 1-\sqrt{2}$

But for the cube or any higher root, no general rule can be given

**SECT. V SIMILAR EQUATIONS**

An equation is a proposition asserting the equality of two quantities, and is expressed by placing the equals sign between them

A Simple Equation is that which contains only one power of the unknown quantity, without including different powers

Thus  $x-2a+3b=c$  is a simple equation, con-

taining only one power of the unknown quantity

**Reduction of Equations**, is the method of finding the value of the unknown quantity

It consists in ordering the equation so, that the unknown letter or quantity may stand alone on one side of the equation, or of the mark of equality, without a coefficient, and all the rest, or the known quantities, on the other side. In general, the unknown quantity is disengaged from the known ones by performing the reverse operations. So, if they are connected with it by + or addition, they must be subtracted, if by minus (-), or subtraction, they must be added, if by multiplication we must divide by them if by division, we must multiply, also, any power of the unknown quantity is taken away by extracting the root, and any root is removed by raising it to the power. As in the following rules, first given by sir Isaac Newton

1 Any quantity may be transposed from one side of the equation to the other by changing its sign. And this rule is used to remove, or take away quantities from the side of the unknown one, when they are connected with it, by the sign + or -, or to remove the unknown quantity from them

Thus, if  $x+3=7$ , then will  $x=7-3=4$

Also, if  $x-a+b=c-d$ , then will  $x=a-b+c-d$

2 If the unknown term be multiplied by any quantity, it is to be taken away by dividing all the other terms of the equation by it

Thus if  $ax-ab=a$  then will  $x=b+1$

And, if  $2x+4=16$ , then will  $x+2=8$ , and  $x=8-2=6$

3 If the unknown term be divided by any quantity it may be taken away, by multiplying all the other terms of the equation by it

Thus if  $\frac{x}{2}=5+3$ , then will  $x=10+6=16$

And, if  $\frac{x}{a}-b+c=d$ , then will  $x=a^2b+ac-a^2d$

4 The unknown quantity in any equation may be made free from surds by transposing the rest of the terms by Rule 1 and then involving each side to such a power as is denoted by the index of the surd

Thus if  $\sqrt{4x+16}=12$ , then will  $4x+16=144$ , or  $4x=144-16=128$ , and if both sides of the equation be divided by 4,  $x$  will be 32

5 If that side of the equation which contains the unknown quantity be a complete power, it may be reduced, by extracting the root of the said power on both sides of the equation

Thus, if  $x^2+6x+9=25$ , then will  $x+3=\sqrt{25}=5$ , or  $x=5-3=2$

6 Any analogy or proportion may be converted into an equation by making the product of the two mean terms equal to that of the two extremes

Thus, if  $3x=16$  5 10, then will  $3x \times 10 =$

$16 \times 5$ , or  $30x=80$ , or  $x=\frac{80}{30}=\frac{8}{3}=4\frac{2}{3}$

And, if  $\frac{2x}{3} = a = b = c$ , then will  $\frac{2cx}{3} = ab$ , and

$2cx = 3ab$ , or  $x = \frac{3ab}{2c}$

7 If the same quantity be found on both sides of the equation, with the same sign, it may be taken away from each, and if every term in an equation be multiplied or divided by the same quantity, it may be struck out of them all

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Thus, if  $4x + a = b + a$ ; then will  $4x = b$ , and

$$x = \frac{b}{4}$$

And, if  $3ax + 5ab = 8ac$ , then will  $3x + 5b = 8c$ , and  $x = \frac{8c - 5b}{3}$

Ex. 1 Given  $5x - 15 = 2x + 6$ , to find the value of  $x$

First,  $5x - 2x = 6 + 15$

Or,  $3x = 6 + 15 = 21$

And therefore  $x = \frac{21}{3} = 7$

Ex 2 Given  $b + x = \sqrt{b^2 + x^2}$ , to find  $x$   
First, by squaring both sides of the equation, we have,  $b^2 + 2bx + x^2 = b^2 + x^2 + x^2$

Then by striking the  $b^2$  from both sides, results,  $2bx + x^2 = x^2 + x^2$

Dividing by  $x$  gives,  $2b + x = \sqrt{a^2 + x^2}$

Squaring both sides,  $4b^2 + 4bx + x^2 = a^2 + x^2$

Striking the  $x^2$  from both sides, and transposing  $4b^2$  gives,  $4bx = a^2 - 4b^2$

And, dividing by  $4b$ ,  $x = \frac{a^2 - 4b^2}{4b} = \frac{a^2}{4b} - b$

Or reducing double, triple &c Equations, containing two, three, or more unknown Quantities

PROB I To Exterminate two unknown Quantities, or, to Reduce the two Simple Equations containing them, to a Single one

Rule I 1 Observe which of the unknown quantities is the least involved, and find its value in each of the equations, by the methods already explained

2 Let the two values, thus found be made equal to each other and there will arise a new equation with only one unknown quantity in it, whose value may be found as before

Rule II 1 Consider which of the unknown quantities you would first exterminate, and let its value be found in that equation where it is least involved

2 Substitute the value thus found for its equal in the other equation and there will arise a new equation with only one unknown quantity whose value may be found as before

Rule III 1 Let the given equations be multiplied, or divided by such numbers or quantities as will make the term which contains one of the unknown quantities the same in both equations

2 Then, by adding or subtracting the equations according as the case may require there will arise a new equation, with only one unknown quantity, as before

PROB II To Exterminate the Unknown Quantities, or, to Reduce the three Simple Equations, containing them, to a Single one

Rule I Let  $x, y, z$ , be the three unknown quantities, to be exterminated

2 Find the value of  $x$  from each of the three given equations

3 Compare the first value of  $x$  with the second, and an equation will arise involving only  $y$  and  $z$

4 In like manner, compare the first value of  $x$  with the third, and another equation will arise involving only  $y$  and  $z$

5 Find the values of  $y$  and  $z$  from these two equations, according to the former rules, and  $x, y$ , and  $z$ , will be exterminated as required

Note Much in the same manner may any number of unknown quantities be exterminated But there are often shorter methods for performing

the operation, which will be best learnt from practice

Ex 1 Given  $\begin{cases} x + y + z = 29 \\ x + 2y + 3z = 62 \\ \frac{1}{2}x + \frac{1}{3}y + \frac{1}{4}z = 10 \end{cases}$ , to find  $x, y$ , and  $z$

From the first  $x = 29 - y - z$

From the second,  $x = 62 - 2y - 3z$

From the third  $x = 20 - \frac{1}{3}y - \frac{1}{4}z$

Whence  $29 - y - z = 62 - 2y - 3z$

And  $29 - y - z = 20 - \frac{1}{3}y - \frac{1}{4}z$

Also from the first of these,  $y = 33 - 2x$

And from the second,  $y = 27 - \frac{1}{2}x$

Therefore  $33 - 2x = 27 - \frac{1}{2}x$ , or  $x = 12$

Whence also  $y = 33 - 2x = 9$

And  $x = 29 - y - z = 8$

Ex 2 Given  $x + y = a$ ,  $x + z = b$ , and  $y + z = c$ , to find  $x, y, z$

(1)  $x + y = a$

(2)  $x + z = b$

(3)  $y + z = c$

Their sum is (4)  $2x + 2y + 2z = a + b + c$

Its half is (5)  $x + y + z = \frac{1}{2}a + \frac{1}{2}b + \frac{1}{2}c$

From this take (1) and there remains  $x = \frac{1}{2}a + \frac{1}{2}b - \frac{1}{2}c$

From (5) take (2), leaves  $y = \frac{1}{2}a - \frac{1}{2}b + \frac{1}{2}c$

From (5) take (3) leaves  $z = -\frac{1}{2}a + \frac{1}{2}b + \frac{1}{2}c$

QUEST I The paving of a square at 2s a yard costs as much as the inclosing it at 5s a yard required the side of the square?

Let  $x$  = side of the square sought,

Then  $4x$  = yards of inclosure,

And  $x^2$  = yards of pavement,

Hence  $4x \times 5 = 20x$  = price of inclosing,

And  $x^2 \times 2 = 2x^2$  = price of paving,

But  $2x^2 = 20x$  by the question,

Therefore  $2x = 20$ , and  $x = 10$  = length of the side required

2 A market woman bought in a certain number of eggs at two a penny, and as many at three a penny, and sold them all out again at the rate of five for two pence, and by so doing lost fourpence, what number of eggs had she?

Let  $x$  = number of eggs of each sort,

Then will  $4x$  = price of the first sort,

And  $3x$  = price of the second sort,

But  $5 \times 2x$  (the whole number of eggs)  $10x$ ,

Whence  $4x$  price of both sort, at 5 for 2 pence,

And  $\frac{1}{2}x + \frac{1}{2}x - \frac{1}{2}x = 4$  by the question,

That is  $x + \frac{1}{2}x - \frac{1}{2}x = 8$ ,

Or  $3x + 2x - x = 24$ ,

Or  $4x + 10x - 24x = 120$ ,

Or  $x = 120$  = number of eggs of each sort required

3 A person has two horses, and a saddle worth 50 now if the saddle be put on the back of the first horse, it will make his value double that of the second but if it be put on the back of the second, it will make his value triple that of the first, what is the value of each horse?

Let the first horse be denoted by  $x$ , and the second by  $y$

Then  $x + 50 = 2y$

And  $y + 50 = 3x$

From the first equation,  $x = 2y - 50$

This value substituted for  $x$  in the second,

gives  $y + 50 = 3(2y - 50) = 6y - 150$

Consequently  $6y - y - 50 + 150$ ,

that is  $5y = 200$ , or  $y = 40$

Hence  $x = 2y - 50 = 80 - 50 = 30$

## SECT VI QUADRATIC EQUATIONS.

A Simple Quadratic Equation, is that which involves the square of the unknown quantity only

An affected or affected quadratic equation, is that which involves the square of the unknown,

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quantity in the terms, and the first power in as other terms.

Thus,  $ax^2 = b$ , is a simple quadratic equation; And  $ax^2 + bx = c$ , is an affected quadratic equation.

The rule for a simple quadratic equation has been given already.

**Rule 1** Transpose all the terms involving the unknown quantity to one side, and the known terms to the other, and so that the term containing the square of the unknown quantity may be positive.

2 If the square of the unknown quantity is multiplied by any coefficient, all the terms of the equation are to be divided by it, so that the coefficient of the square of the unknown quantity may be 1.

3 Add to both sides the square of half the coefficient of the unknown quantity, and the side of the equation involving the unknown quantity will be a complete square.

4. Extract the square root from both sides of the equation, and by transposing the abovementioned half-coefficient, a value of the unknown quantity is obtained in known terms.

The reason of this rule is manifest from the composition of the square of a binomial, for it consists of the squares of the two parts, and twice the product of the two parts.

The different forms of quadratic equations, expressed in general terms, being reduced by the first and second parts of the rule, are these.

$$1 \quad ax^2 = b^2$$

$$2 \quad x^2 - ax = b^2$$

$$3 \quad x^2 - ax = -b^2$$

**Case 1**  $x^2 + ax = b^2$

$$x^2 + ax + \frac{a^2}{4} = b^2 + \frac{a^2}{4}$$

$$x + \frac{a}{2} = \pm \sqrt{b^2 + \frac{a^2}{4}}$$

$$x = \pm \sqrt{b^2 + \frac{a^2}{4}} - \frac{a}{2}$$

**Case 2**  $x^2 - ax = b^2$

$$x^2 - ax + \frac{a^2}{4} = b^2 + \frac{a^2}{4}$$

$$x - \frac{a}{2} = \pm \sqrt{b^2 + \frac{a^2}{4}}$$

$$x = \frac{a}{2} \pm \sqrt{b^2 + \frac{a^2}{4}}$$

**Case 3**  $x^2 - ax = -b^2$

$$x^2 - ax + \frac{a^2}{4} = \frac{a^2}{4} - b^2$$

$$x - \frac{a}{2} = \pm \sqrt{\frac{a^2}{4} - b^2}$$

$$x = \frac{a}{2} \pm \sqrt{\frac{a^2}{4} - b^2}$$

1. Every quadratic equation will have two roots, except such of the third form whose roots become impossible.

2. In the two first forms one of the roots must be positive, and the other negative.

3. In the third form, if  $\frac{a^2}{4}$  or the square of half the coefficient of the unknown quantity, be greater than  $b^2$ , the known quantity, the two roots will be positive. If  $\frac{a^2}{4}$  be equal to  $b^2$ , the

two roots become equal; but if  $\frac{a^2}{4}$  is less than  $b^2$ ,

the quantity under the radical sign becomes negative, and the two roots are impossible.

4. If the equation express the relation of magnitudes abstractly considered, where a contrary cannot be supposed to take place, the negative roots cannot be of use, or rather there are no such roots, for then a negative quantity by itself is unintelligible, and therefore the square root of a positive quantity must be positive only.

**Ex 1** Given  $\frac{1}{2}x^2 - \frac{1}{2}x + 20\frac{1}{2} = 42\frac{1}{2}$ , to find  $x$ .

Here,  $\frac{1}{2}x^2 - \frac{1}{2}x = 42\frac{1}{2} - 20\frac{1}{2} = 22\frac{1}{2}$  by transposition; And  $x^2 - x = 44\frac{1}{2}$  by multiplying by 2.

Then  $x^2 - \frac{1}{2}x + \frac{1}{4} = 44\frac{1}{2} + \frac{1}{4} = 44\frac{3}{4}$  by completing the square,

Hence  $x - \frac{1}{4} = \sqrt{44\frac{3}{4}} = 6\frac{1}{2}$  by evolution,

Therefore  $x = 6\frac{1}{2} + \frac{1}{4} = 7$  the answer.

2. Given  $ax^2 + bx = c$ , to find  $x$ .

First,  $x^2 + \frac{b}{a}x = \frac{c}{a}$  by division,

Then  $x^2 + \frac{b}{a}x + \frac{b^2}{4a^2} = \frac{c}{a} + \frac{b^2}{4a^2}$  by completing the square,

And  $x + \frac{b}{2a} = \sqrt{\left(\frac{c}{a} + \frac{b^2}{4a^2}\right)} = \sqrt{\frac{4ac + b^2}{4a^2}}$  by evolution,

Therefore  $x = \pm \sqrt{\left(\frac{4ac + b^2}{4a^2}\right)} - \frac{b}{2a}$ .

When the terms of a quadratic of this form  $ax^2 - bx = -c$ , are so related that  $b - c = a$ , then will the two roots of the equation be unity and  $\frac{c}{a}$ .

Thus, if  $4x^2 - 7x = -3$ , then  $x = 1$  or  $= \frac{3}{4}$ .

If  $7x^2 - 23x = -16$ , then  $x = 1$ , or  $x = \frac{16}{7}$ . And so of others. The demonstration of this useful property is left for the learner's ingenuity.

In many cases the roots of quadratic equations may be more readily obtained by a table of logarithmic sines and tangents than by any other method: the precepts for this purpose are these.

1. If the relation of three assumed lines  $a$ ,  $b$ , and  $x$  be such, that  $ax - x^2 = b^2$ ; then it will be, as  $\frac{1}{2}a$   $b$  radius the sine of an angle. And as  $a$  radius the tangent (or cotangent) of half that angle  $\frac{1}{2}x$ .

2. If the relation of three lines  $a$ ,  $b$ , and  $x$ , be such that  $x^2 - ax = b^2$ , then it will be, as  $\frac{1}{2}a$   $b$  radius: the tangent of an angle. And as  $a$  radius: the tangent or cotangent of half this angle (according as the sign of  $ax$  is positive or negative)  $\frac{1}{2}x$ .

**QUEST 1** Sold a piece of cloth for 24*l*. and gained as much *per cent*, as the cloth cost me: what was the price of the cloth?

Let  $x$  = pounds the cloth cost,

Then  $24 - x$  = whole gain,

But  $100 - x$   $x$   $24 - x$  by the question,

Or  $x^2 = 100 \times \frac{24 - x}{100} = 2400 - 100x$ ,

That is,  $x^2 + 100x = 2400$ ,

Then  $x^2 + 100x + 2500 = 4900$  by completing the square;

And  $x + 50 = \sqrt{4900} = 70$  by extraction of roots; Consequently  $x = 70 - 50 = 20$  = price of the cloth.

2. A person bought a number of acres for 2*l*. and if he had bought four more for the same money, he would have paid at *last* for each acre how many did he buy?

Let the number of acres be represented by  $x$ ,

Then will  $\frac{20}{x}$  be the price of each.

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And  $\frac{80}{x+4}$  = price of each, if  $x+4$  had cost 80L.

But  $\frac{80}{x} = \frac{80}{x+4} + 1$  by the question,

Or  $80 = \frac{80x}{x+4} + x$ , by multiplication,

Or  $80x + 320 = 80x + x^2 + 4x$ , by the same,

That is,  $x^2 + 4x = 320$

Then  $x^2 + 4x + 4 = 324$  by completing the square,

And  $x + 2 = \sqrt{324} = 18$  by evolution,

Conseq.  $x = 18 - 2 = 16$ , the number of oxen required.

3 The sum of two numbers added to their product make 41, and the sum of the squares made less by the sum of the numbers leaves 56. What are the numbers?

Let  $x$  and  $y$  represent the numbers

Then (1)  $x + y + xy = 41$

And (2)  $x^2 + y^2 - (x + y) = 56$

Twice equa. (1) added to equa. (2) gives  $x^2 + 2xy + y^2 + x + y = 132$ ,

That is  $(x + y)^2 + (x + y) = 132$ .

Considering  $x + y$  as one unknown quantity, and completing the square, we have  $(x + y)^2 + (x + y) + \frac{1}{4} = 132\frac{1}{4} = 133$

Extract the root,  $x + y + \frac{1}{2} = 11\frac{1}{2}$

By transposing  $\frac{1}{2}$ ,  $x + y = 11\frac{1}{2} - \frac{1}{2} = 11$

Substituting this value of  $x + y$  for it in equa. (1) and transposing, we have  $xy = 41 - 11 = 30$

The last equa. but one gives  $x = 11 - y$ ,

And the last gives  $x = \frac{30}{y}$

Therefore, by equality,  $11 - y = \frac{30}{y}$

Multiplying by  $y$ ,  $11y - y^2 = 30$

Changing the signs,  $y^2 - 11y = -30$

Compl. the square,  $y^2 - 11y + \frac{121}{4} = \frac{121 - 120}{4} = \frac{1}{4}$

Extracting the root,  $y - \frac{11}{2} = \pm \frac{1}{2}$

Transposing  $\frac{11}{2}$ , gives  $y = \frac{11}{2} \pm \frac{1}{2} = 6$  or  $5$

Hence  $x = 11 - y = 5$  or  $6$

So that 5 and 6 are the numbers sought

## SECT VII EQUATIONS OF ALL DEGREES

1. Of the Origin and Composition of Equations, and of the Signs and Coefficients of their Terms.

The higher orders of equations, and their general affections, are best investigated by considering their origin from the combination of inferior equations

In this general method, all the terms of any equation are brought to one side, and the equation is expressed by making them equal to 0. Therefore if a root of the equation be inserted instead of  $(x)$  the unknown quantity, the positive terms will be equal to the negative, and the whole must be equal to 0

Def. When any equation is put into this form, the term in which  $(x)$  the unknown quantity is of the highest power is made the *First*, that in which the index of  $x$  is less by 1 is the *second*, and so on, till the last into which the unknown quantity does not enter, and which is called the *Absolute Term*

Prop. I If any number of equations be multiplied together, an equation will be produced, of which the dimension is equal to the sum of the dimensions of the equations multiplied

If any number of simple equations be multiplied together, as  $x - a = 0$ ,  $x - b = 0$ ,  $x - c = 0$ , &c. the product will be an equation of a dimension, containing as many units as there are simple equations. In the same manner, if higher equations are multiplied together, as a cubic and a quadratic, one of the fifth order is produced, and so on.

Corollary. An equation of any dimension is considered as compounded either of simple equations, or of other such that the sum of their dimensions is equal to the dimension of the given one. By the resolution of equations these inferior equations are discovered, and by investigating the component simple equations, the roots of any higher equation are found

Cor. 1 An equation admits of as many solutions, or has as many roots, as there are simple equations which compose it

Cor. 2 And conversely no equation can have more roots than it has dimensions

Cor. 3 Imaginary or impossible roots must enter an equation by pairs, for they arise from quadratics, in which both the roots are such. And an equation of an even dimension may have all its roots, or any even number of them impossible; but an equation of an odd dimension must at least have one possible root

Cor. 4 The roots are either positive or negative, according as the roots of the simple equations from which they are produced, are positive or negative

Cor. 5 When one root of an equation is discovered, one of the simple equations is found, from which the given one is compounded. The given equation, therefore being divided by this simple equation, will give an equation of a dimension lower by 1

Prop. II. To explain the general properties of the signs and coefficients of the terms of an equation

Let  $x - a = 0$ ,  $x - b = 0$ ,  $x - c = 0$ ,  $x - d = 0$  &c. or let  $a, b, c, d$ , &c. be the assumed roots of an equation to be generated. Then, according to the method invented by Harriot, multiply these equations together, thus

$$x - a = 0$$

$$x - b = 0$$

$$x - c = 0$$

$$x - d = 0$$

$$x^2 - ax$$

$$-bx + ab$$

$$x^2 - a$$

$$-b$$

$$x - c$$

$$-d$$

$$x^2 - a + b$$

$$-c$$

$$x^2 - a + b$$

$$-c$$

$$x^2 - a$$

$$-b$$

$$x - d$$

$$-e$$

$$x^3 - a$$

$$-b$$

$$x^3 - a$$

$$-b$$

$$x^3 - a$$

$$-b$$

$$x^3 - a$$

$$-b$$

$$x^3 - a$$

$$-b$$

$$x^3 - a$$

$$-b$$

$$x^3 - a$$

$$-b$$

$$x^3 - a$$

$$-b$$

$$x^3 - a$$

$$-b$$

$$x^3 - a$$

$$-b$$

$$x^3 - a$$

$$-b$$

$$x^3 - a$$

$$-b$$

From this table it is plain,

1 That in a complete equation the number of terms is always greater by unit than the dimension of the equation

2 The coefficient of the first term is 1

3 The coefficient of the second term is the sum of all the roots  $(a, b, c, d, \&c)$  with their signs changed.

4 The coefficient of the third term is the sum of all the products that can be made by multiplying any two of the roots together.



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The coefficient of the fourth term is the sum of all the products which can be made by multiplying together any three of the roots with their signs changed, and so of others.

The last term is the product of all the roots, with their signs changed.

3 From induction it appears, that in any equation (the terms being regularly arranged as in the preceding example) there are as many positive roots as there are changes in the signs of the terms from + to -, and from - to +, and the remaining roots are negative. The rule also may be demonstrated.

*Nota.* The impossible roots in this rule are supposed to be either positive or negative.

*Cor.* If a term of an equation is wanting the positive and negative parts of its coefficient must then be equal. If there is no absolute term, some of the roots = 0, and the equation may be depressed by dividing all the terms by the lowest power of the unknown quantity in any of them. In this case also,  $x=0$ ,  $x=0$ , &c. may be considered as so many of the component simple equations, by which the given equation being divided, it will be depressed so many degrees.

It has been commonly taken for granted, from the time of Harriot down to the present, or at least inferred from very faulty reasoning, that any equation of any degree whatever is the product of as many simple factors as there are units in the exponent of its degree. This proposition has been proved conditionally by Lacroix, in the following manner.

It is evident from the rules of division alone, that the first member of the equation

$x^n + Px^{n-1} + Qx^{n-2} + \&c = 0$   
being divided by  $x-a$ , will give a quotient of the form

$x^{n-1} + 1'x^{n-2} + Q_1x^{n-3} + \&c$   
P, Q, &c denoting known quantities different from P, Q, &c we have therefore

$x^n + Px^{n-1} + \&c = (x-a)(x^{n-1} + 1'x^{n-2} + \&c)$  so that according to the observation we shall develop under the article *QUADRATICS* the equation proposed is verified in two ways, namely, by making

$$x-a=0, \text{ or } x^{n-1} + P_1x^{n-2} + \&c = 0$$

If now the equation  $x^{n-1} + P_1x^{n-2} + \&c = 0$ , having one root =  $b$ , its first member will be divisible by  $x-b$ , we have therefore

$$x^{n-1} + P_1x^{n-2} + \&c = (x-b)(x^{n-2} + P_2x^{n-3} + \&c)$$

$$\text{and consequently } x^n + Px^{n-1} + \&c = (x-a)(x-b)(x^{n-2} + P_2x^{n-3} + \&c)$$

The equation proposed may therefore be verified three ways, namely, by making

$$x-a=0, x-b=0, \text{ or } x^{n-2} + P_2x^{n-3} + \&c = 0$$

If the last of these equations have one root  $c$ , its first member is resolvable again into two factors

$$(x-c)(x^{n-3} + P_3x^{n-4} + \&c) = 0$$

$$\text{and we have } x^n + Px^{n-1} + \&c = (x-a)(x-b)(x-c)(x^{n-3} + P_3x^{n-4} + \&c)$$

where it appears that the equation proposed may be verified after four manners, namely, by making

$$x-a=0, x-b=0, x-c=0, x^{n-3} + P_3x^{n-4} + \&c = 0$$

By continuing to reason thus, we shall obtain successively the factors of the degrees  $n-4$ ,  $n-5$ ,  $n-6$ , &c, and if each of these factors, being equal to zero, be susceptible of a root, the first member of the proposed equation will be reduced to the form

$$(x-a)(x-b)(x-c)(x-d)(x-l),$$

that is to say, it will be decomposed into as many factors of the first degree, as there are units in the exponent  $n$  of its dimension. The equation

$$x^n + Px^{n-1} + Qx^{n-2} + \&c = 0$$

may therefore be verified in  $n$  different ways, namely, by making

$$x-a=0, \text{ or } x-b=0, \text{ or } x-c=0, \text{ or } x-d=0, \text{ or } \text{lastly } x-l=0,$$

$l$  being supposed the last of the roots found by the process indicated above.

It must here be remarked, that these equations can only be regarded as true alternately, and that we should fall into manifest contradictions if we were to suppose that they all obtain at the same time. In effect, if  $x-a=0$ , we deduce  $x=a$ , while  $x-b=0$ , gives  $x=b$ , quantities which can never agree when  $a$  and  $b$  are unequal quantities.

The first member of the proposed equation

$$x^n + Px^{n-1} + Qx^{n-2} + \&c = 0,$$

being decomposed into  $n$  factors of the first degree

$x-a, x-b, x-c, x-d, x-l$   
cannot have other factors of the same degree. In fact, if this first member were divisible by  $x-a$ , for example we must have necessarily

$$x^n + Px^{n-1} + \&c = (x-a)(x^{n-1} + P_1x^{n-2} + \&c)$$

and consequently

$$(x-a)(x-b)(x-c)(x-d)(x-l)$$

$= (x-a)(x^{n-1} + P_1x^{n-2} + \&c)$ , but the first member of this equation vanishing when  $x=a$  it ought to be the same with regard to the second, which would, in this case, become

$$(a-a)(a^{n-1} + P_1a^{n-2} + \&c),$$

and as  $a$  and  $a$  are supposed unequal, the first factor  $a-a$  is not = 0, it is therefore the factor

$$a^{n-1} + P_1a^{n-2} + \&c$$

which must become so hence, the quantity  $a$  is necessarily a root of the equation

$$x^{n-1} + P_1x^{n-2} + \&c = 0$$

And from this it follows, that its first member is divisible by  $x-a$ , and that

$$x^{n-1} + P_1x^{n-2} + \&c = (x-a)(x^{n-2} + P_2x^{n-3} + \&c)$$

$$\text{whence it results that } (x-a)(x-b)(x-c)(x-d)(x-l)$$

$$= (x-a)(x-a)(x^{n-2} + P_2x^{n-3} + \&c)$$

Dividing the two members of this equation by  $x-a$ , we deduce

$$(x-b)(x-c)(x-d)(x-l)$$

$$= (x-a)(x^{n-3} + P_3x^{n-4} + \&c)$$

Proceeding thus till we have taken away successively from each member  $n-1$  factors, there will only remain in the one  $x-l$ , and in the other  $x-a$ , we must therefore conclude, that  $x-l = x-a$ , or  $l=a$ , which is contradictory to the original supposition. From all this it follows, that an equation of any degree whatever, cannot be produced by a number of simple factors, greater than the exponent of its degree. Lacroix, I 206

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Other reflections on this subject may be seen in the second volume of LACROIX'S algebra.

## 2 Transformation of Equations

*Prop 1* The affirmative roots of an equation become negative, and the negative become affirmative, by changing the signs of the alternate terms beginning with the second.

Thus the roots of the equation  $x^4 - x^3 - 19x^2 + 49x - 30 = 0$ , are  $+1, +2, +3, -5$ , whereas the roots of the equation  $x^4 + x^3 - 19x^2 - 49x + 30 = 0$ , are  $-1, -2, -3, +5$ .

The reason of this is derived from the composition of the coefficients of these terms which consist of combinations of odd numbers of the roots.

*Prop 2* An equation may be transformed into another that shall have its roots greater or less than the roots of the given equation by some given difference.

Let  $e$  be the given difference, then  $y = x \pm e$ , and  $x = y \mp e$ , and if for  $x$  and its powers in the given equation,  $y \mp e$  and its powers be inserted a new equation will arise, in which the unknown quantity is  $y$ , and its value will be  $x \pm e$ .

Let the equation proposed be  $x^3 - px^2 + qx - r = 0$ , of which the roots must be diminished by  $e$ . By inserting for  $x$  and its powers  $y + e$  and its powers, the equation required is,

$$\left. \begin{aligned} y^3 + 3ey^2 + 3e^2y + e^3 \\ - 1y^2 - 2pey - pe^2 \\ + qy + qe \\ - r \end{aligned} \right\} = 0$$

*Cor 1* The use of this transformation is to take away the second, or any other intermediate term, for as the coefficients of all the terms of the transformed equation, except the first, involve the powers of  $e$  and known quantities only by putting the coefficient of any term equal to 0, and resolving that equation a value of  $e$  may be determined, which being substituted, will make that term to vanish.

Thus let the coefficient  $3e - p = 0$ , and  $e = \frac{1}{3}p$  which being substituted for  $e$ , the new equation will want the second term. And unvulsily the coefficient of the first term of an equation of  $n$  dimensions being 1, the second term may be taken

away, by supposing  $x = y \pm \frac{1}{n}p$ .

*Cor 2* The second term may be taken away by the solution of a simple equation, the third by the solution of a quadratic and so on.

*Prop 3* An equation may be transformed into another of which the roots shall be equal to the roots of the given equation, multiplied or divided by a given quantity.

$$\text{Let } y = xz, \text{ or } y = \frac{x}{z}$$

Then substitute for  $x$  and its powers,  $\frac{y}{z}$  or  $yz$  and its powers, and the new equation will have the property required.

*Cor 1* An equation, in which the coefficient of the first term is any known quantity, as  $a$ , may thus be transformed into another, in which the coefficient of the first term shall be unit. Thus, let the equation be  $ax^3 - px^2 + qx - r = 0$

Suppose  $y = ax$ , or  $x = \frac{y}{a}$ , and for  $x$  and its powers insert  $\frac{y}{a}$  and its powers, and the equation be-

comes  $\frac{y^3}{a^3} - \frac{py^2}{a^2} + \frac{qy}{a} - r = 0$ , or  $y^3 - py^2 + qay - a^3r = 0$

*Cor 2* If there are fractions in an equation, they may be taken away, by multiplying the equation by the denominators, and by this proposition the equation may then be transformed into another, without fractions, in which the coefficient of the first term is 1. In like manner may a surd coefficient be taken away in certain cases.

*Cor 3* Hence also, if the coefficient of the second term of a cubic equation be not divisible by 3, the fractions thence arising in the transformed equation wanting the second term, may be taken away by the preceding corollary. But the second term also may be taken away, so that there shall be no such fractions in the transformed equation, by supposing  $x = \frac{x+p}{3}$ ,  $\pm p$  being

the coefficient of the second term of the given equation. And if the equation  $ax^3 - px^2 + qx - r = 0$  be given, in which  $p$  is not divisible by 3, by supposing  $x = \frac{x+p}{3a}$ , the transformed equation re-

duced is  $x^3 - 3px^2 + 9aqx - 2p^3 + 9apq - 7a^3r = 0$ , wanting the second term, having 1 for the coefficient of the first term, and the coefficients of the other terms being all integers.

*General Corollary to Prop 1, 2, 3*

If the roots of any of these transformed equations be found by any method, the roots of the original equation, from which they were derived, will easily be found from the simple equations expressing their relation. Thus, if 8 is found to be a root of the transformed equation  $x^3 + 23x - 696 = 0$ , since  $x = \frac{z+2}{5}$ , the corresponding root of

the given equation  $5x^3 - 6x^2 + 7x - 30 = 0$  must be  $\frac{8+2}{5} = 2$ . It is to be observed also, that the rea-

soning in Prop 2, and 3, and the Corollaries may be extended to any order of equations, though in them it is applied chiefly to cubics.

## 1 General Resolution of Equations

The general resolution of equations of all degrees being the principal object of algebra, various means have been attempted to extend and perfect the theory. But the efforts which have yet been made of this kind, have been successful only in solving equations of the first four degrees. And even the method for cubic and biquadratic equations has the inconvenience of not always giving the roots under a finite form. See BIQUADRATIC and CUBIC. But there are in the higher degrees equations subject to certain conditions which either admit a general resolution, or a depression to inferior degrees, and thus diminish the difficulty. We shall here give specimens of some of the most useful methods.

The most general methods are those by APPROXIMATION, one of which will be explained under that word in this Dictionary. Another, which has been much recommended by Dr HUTTON, and is the same as the method of IRAL and ERROR, is as follows.

1 Find, by trial, two numbers, as near the true root as possible, and substitute them in the given equation instead of the unknown quantity, marking the errors which arise from each of them.

2 Multiply the difference of the two numbers, found by trial, by the least error, and divide the

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product by the difference of the *works*, when they are alike, but by their sum when they are unlike. Or say, as the difference or sum of the errors is to the difference of the two numbers, so is the least error to the correction of its supposed number.

3 Add the quotient, last found, to the number belonging to the least error, when that number is too little, but subtract it when too great, and the result will give the true root *nearly*.

4 Take this root and the nearest of the two former, or any other that may be found nearer, and, by proceeding in like manner, a root will be had still nearer than before, and so on to any degree of exactness required.

*Note.* It is best to employ always two assumed numbers that shall differ from each other only by unity in the last figure on the right, because then, the difference, or multiplier, is only 1.

Ex Find the root of the equation  
 $x^3 - 15x^2 + 63x = 50$

Suppose therefore 10 and 11, and work as follows

10	-	11
630	-	630
-15	-	-15
1	-	1
49	-	sums
1	-	errors
325	-	sum of the errors
As 325	-	103 correct
	-	100

Hence  $x = 103$  nearly

Again, suppose the two numbers 103 and 102, &c as follows

103	-	102
6489	-	6324
-15915	-	-15606
1092727	-	1061208
50069227	-	sums
49	-	715208
+ 069227	-	errors
284792	-	-284792
354019	-	01
	-	069227 -
	-	0019555
	-	103

This taken from

leaves  $x$  nearly = 100.804

When one of the roots of an equation has been found by approximation, as above, the rest may be found as follows.—Take for a dividend, the given equation, with the known term transposed, with its sign changed, to the unknown side of the equation; and for a divisor, take  $x$  minus the root just found. Divide the said dividend by the divisor, and the quotient will be the equation depressed a degree lower than the given one.

Find a root of this new equation by approximation, as before, and it will be a second root of the original equation. Then, by means of this root, depress the second equation one degree lower, and find a third root, and so on, till the equation be reduced to a monomial, then the next root of this being found, by the method of approximation, they will make up the remainder of the roots. Thus, in the foregoing example, having found one root to be 100.804,

connect it by minus with  $x$  for a divisor, and the equation for a dividend, &c as follows:

And the two roots of this quadratic equation, or  $x^2 - 1397196x + 4863837$ , by completing the square, are 657653 and 739543, which are also the other two roots of the first given cubic equation. So that all the three roots of that equation, viz  $x^3 - 15x^2 + 63x = 50$ , are 102804, and 657653, and 739543  
 and the sum of all the roots is found to be 15, being equal to the coefficient of the second term of the equation, which the sum of the roots always ought to be when they are right

Sursolid equations may sometimes be resolved without much difficulty when there is a particular relation of the coefficients to the absolute number, or of one coefficient to the rest.

Thus, for example, let  
 $x^5 + Ax^4 + Bx^3 + Cx^2 + Dx + E = 0$ , and let  
 $E = \frac{DA}{2} + \frac{CA^2}{4} + \frac{BA^3}{8} + \frac{A^5}{32}$ , then will the roots of the following equations be that of the proposed one, viz

$x^4 + px^3 + qx^2 + rx + s = 0$ , and  $x + p = 0$   
 where  $p = \frac{1}{2}A$ ,  $q = B - \frac{1}{4}A^2$ ,  $r = C - \frac{1}{2}AB + \frac{1}{8}A^3$ , and  $s = D - \frac{1}{4}CA + \frac{1}{8}A^2B - \frac{1}{16}A^4$ . For the two equations multiplied together produce  
 $x^5 + px^4 + qx^3 + rx^2 + sx + p^2x^3 + p^2qx^2 + p^2rx + p^2s = 0$   
 And the coefficients being equated, we get the values of  $p, q, r, s$ , and the particular relation of  $E$ , as above.

Let this formula be applied to the numeral sursolid equation  $x^5 + 26x^4 + 225x^3 + 820x^2 + 1244x + F = 0$ , where the coefficients are assumed at pleasure. Here then  $A = 26$ ,  $B = 225$ ,  $C = 820$ ,  $D = 1244$ , and therefore  $E$ , found by the preceding formula for it, will be = 624, the absolute number. Hence  $p = 13$ ,  $q = 56$ ,  $r = 92$ , and  $s = 48$ , then will the roots of the biquadratic  $x^4 + 13x^3 + 56x^2 + 92x + 48 = 0$ , be found to be = 1, -2, -4, and -6, and consequently those of the proposed equation will be = 1, -2, -4, -6, and -13.

The following general formula of Dr Clairaut for sursolid equations, may often be of use.

If  $x^5 + ax^4 + bx^3 + cx^2 + dx + m = 0$ , then will  $x$  be found by this theorem,

$$x = \frac{4m^2 + 3am^3 + 2bm^2 + cm^2 - m}{d + 5m^2 + 4am^3 + 3bm^2 + 2cm^2}$$

In which if when the value of  $m$  is substituted there is no remainder, the quotient gives one value of  $x$ , otherwise, this quotient must be substituted for  $m$ , and thus repeated till it either terminates or be as near the true root as necessary.

The reason of thus assuming  $m$  will be obvious, if we consider, that  $m$  is always the product of all the roots (having their signs changed), and therefore  $m$  will either be a root, or near one.

Ex Required the five roots of  $x^5 - 23x^4 + 159x^3 - 459x^2 + 564x - 243 = 0$

Here  $m^2 = 3$ , which is affirmative because the signs change alternately and  $4m^3 = 4m^2 + 9723m^2 = -5520, 2bm^2 = 85995, cm^2 = 4132, dm^2 + 243, d = 56475, 5m^2 = 7503, 4am^3 = 23403$

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$3m^2 = + 42975$ , and  $2m^2 = 2754$ . These values substituted in the general formula give  $x=3$  a root. Then, dividing the given equation by  $x-3$ , we reduce it to this biquadratic,  $x^4 - 20x^2 + 99 = 0$ , the roots of which will be found to be 1, 4, 13, 5, and 15. Hence the five roots of the proposed surd are 1, 4, 13, 5, and 15.

## De Moivre's Method.

The equations to which this method applies are called *convertible or recurring equations*, since when all the terms are placed on one side the mark of equality, they form expressions such, 1st That the unknown quantity  $x$ , and a given quantity  $k$ , have together, or separately the same number of dimensions in all the terms. 2dly That the numerical coefficients of the terms equally distant from the two extremes, are the same and have the same sign. Such are the equations

$$\begin{aligned} x^3 + px^2 + qx + r &= 0 \\ x^4 + px^3 + qx^2 + rx + s &= 0. \end{aligned}$$

The method of resolving these equations will be obvious from a few examples and if we suppose  $k$  to be constantly = 1, it will not cause any restriction in the method. Let us take for example,  $x^4 - px^2 + q = 0$ . The roots of such equations are of the form  $a, b, \frac{1}{a}, \frac{1}{b}$ .

If a recurring equation be of an odd number of dimensions, it may be easily shewn that one of its roots will be + 1, or - 1, according as the sign of the last term is -, or +.

The roots of a recurring equation of even dimensions, exceeding a quadratic, may be found by the solution of an equation of half the number of dimensions. Let  $x^m - px^{m/2} + q = 0$ , its root being of the form  $a, \frac{1}{a}, b, \frac{1}{b}$ , &c may be conceived to be made up of

quadratic factors,  $x - a, x - \frac{1}{a}, x - b, x - \frac{1}{b}$ , &c

i. e. if  $m = a + \frac{1}{a}, n = b + \frac{1}{b}$ , &c. of the quadratic factors  $x^2 - mx + 1, x^2 - nx + 1$ , &c. Then, multiplying these together, and equating the coefficients with those of the proposed equation, the values of  $m, n$ , &c. may be found. Moreover, since the values of  $x$  are  $a, \frac{1}{a}, b, \frac{1}{b}$ , &c. and the values of  $m$  are  $a + \frac{1}{a}, b + \frac{1}{b}$ , &c. there are only half as many values of  $m$  as there are of  $x$ , and therefore the equation for determining the value of  $m$ , will run to only half the dimensions which  $x$  runs to in the original equation.

When the dimensions of a recurring equation are odd, since one of its roots is either + 1, or - 1, it may readily be reduced to one of the same kind, of even dimensions, by division.

Ex. 1. Let  $x^3 - 1 = 0$ . One root of the equation being unity, divide  $x^3 - 1$  by  $x - 1$ , and the equation  $x^2 + x + 1 = 0$ , is obtained, from which

we get the other two roots,  $\frac{-1 \pm \sqrt{-3}}{2}$ , and

These roots are, as is well known, the three cube roots of 1.

In the same manner, the roots of the equation  $x^5 + 1 = 0$ , are found to be - 1,  $\frac{-1 \pm \sqrt{-5}}{2}$ , and  $\frac{-1 \pm \sqrt{-5}}{2}$ .

Ex. 2. Let  $x^4 - 1 = 0$ . Two roots of this equation are + 1, - 1, and by division  $\frac{x^4 - 1}{x^2 - 1} = x^2 + 1 = 0$ , an equation which contains the other two roots  $\pm \sqrt{-1}$  and  $\mp \sqrt{-1}$ .

Ex. 3. Let  $x^4 + 1 = 0$ . Assume  $x^2 = m + \frac{1}{x}$ .  $x^2 - mx + 1 = x^2 + 1$ , that is,  $m^2 - m + 1 = 0$ , or  $m^2 - m + 1 = 0$ , by equating the co-efficients,  $m^2 - m + 1 = 0$ , or  $m^2 - m + 1 = 0$ , hence  $m = \frac{1 \pm \sqrt{-3}}{2}$ , and  $m = \frac{1 \pm \sqrt{-3}}{2}$ . Therefore, the two quadratics which contain the roots of the biquadratic, are

$x^2 + \sqrt{-3}x + 1 = 0$ , and  $x^2 - \sqrt{-3}x + 1 = 0$ , from the solution of which it appears, that the roots are  $\frac{-\sqrt{-3} \pm \sqrt{-1}}{2}$  and  $\frac{\sqrt{-3} \pm \sqrt{-1}}{2}$ .

In the same manner may the roots of the equations  $x^3 + 1 = 0$ , and  $x^5 + 1 = 0$

Indeed, the roots of the general equation  $x^{2m} \pm 1 = 0$ , may readily be ascertained by a table of sines for, it has been proved by various writers, that if C be assumed to express the cosine of an arc A  $m$  times as great as one  $\frac{360^\circ}{n}$  whose cosine is

denoted by  $c$ , then  $C - \sqrt{C^2 - 1} = (c - \sqrt{c^2 - 1})^m$ , and  $C + \sqrt{C^2 - 1} = (c + \sqrt{c^2 - 1})^m$ . Hence, if  $x \pm \sqrt{x^2 - 1}$ , be put =  $z$ , we shall have  $x^2 = (z \pm \sqrt{z^2 - 1})^2 = X \pm \sqrt{X^2 - 1}$ ,  $x$  and  $X$  being supposed cosines of arcs in the constant ratio of  $\frac{1}{2}$ .

Therefore, assuming  $X = 1 = \cos 0^\circ = \cos 360^\circ = \cos 2 \cdot 360^\circ = \cos 3 \cdot 360^\circ$ , &c. the equation will become  $x^2 = 1$ , or  $x^2 - 1 = 0$ , and the different values of  $x$  in the expression  $x \pm \sqrt{x^2 - 1}$  for the root  $x$ , will be the cosines of the arcs  $\frac{0^\circ}{2}, \frac{360^\circ}{2}, \frac{2 \cdot 360^\circ}{2}, \frac{3 \cdot 360^\circ}{2}$ , &c. those arcs being the corresponding submultiples of the above, answering to the cosine  $X = 1$ .

In like manner if  $X$  be taken = - 1 =  $\cos 180^\circ = \cos 3 \cdot 180^\circ = \cos 5 \cdot 180^\circ = \cos 7 \cdot 180^\circ$ , &c. then will  $x^2 = -1$ , or  $x^2 + 1 = 0$  and the values of  $x$  will be the cosines of  $180^\circ, 3 \cdot 180^\circ, 5 \cdot 180^\circ$ , &c.

## Euler's Method.

On contemplating the form under which the roots of equations of the first four degrees present themselves when resolved by the ordinary methods, Euler conjectured, that in general the root of an equation of any degree whatever,  $n$ , might be represented by the formula  $x = A + \sqrt[n]{B}$ ,  $A$  and  $B$  being the unknown quantity of the proposed equation,  $n$  the unknown quantity of the equation of the order immediately inferior,  $n - 1$ ;  $A, B$ , &c. being given or determinate coefficients. The manner of considering the roots of equations, seems to require a very great number in all degrees. But we must content ourselves with showing its application to the first degree.

We shall all along suppose, to simplify the cal-

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culus, that the equation to be resolved is deprived of its second term, by the method already explained in this section

Equa. of second degree  $x^2 + q = 0$

Let us suppose  $\tau = a\sqrt{u}$ , and consequently  $\tau^2 - a^2u = 0$  Comparing this equation term by term with the proposed one  $x^2 + q = 0$  we have  $-a^2u = q$  or (supposing the arbitrary coefficient  $a = 1$ ),  $u = -q$ , and  $\sqrt{u} = \pm \sqrt{-q}$  Therefore  $\tau = \pm \sqrt{-q}$

Third degree  $x^3 + px + q = 0$

Let  $x = a\sqrt[3]{u} + b\sqrt[3]{u}$  and consequently,

$$x^3 = a^3u + 3a^2bu\sqrt[3]{u} + 3ab^2u\sqrt[3]{u} + b^3u^2$$

On the other hand, the formula proposed gives  $x^3 = -px - q$ , or (putting in the second member for  $x$  its supposed value),

$$x^3 = -pa\sqrt[3]{u} - pb\sqrt[3]{u} - q$$

Equating respectively the two values of  $x^3$  by making the rational part of the one equal to the rational part of the other, and the radical parts equal each to each of the radical parts corresponding, we shall have  $a^3u + b^3u^2 = -q$ ,  $3ab^2u = -p$  Whence we see that between the five quantities  $p, q, a, b, u$ , we have simply the two equations just stated We shall suppose therefore, that the value of one of the two coefficients  $a$  and  $b$ , that of  $a$  for example, is 1 then we shall have between  $p, q, b$ , and  $u$ , the two equations,  $1 + b^3u^2 = -q$ , and  $3bu = -p$  The second gives  $b = -\frac{p}{3u}$

which value substituted in the first gives  $u = -\frac{p^3}{27q}$  whence we deduce

$$u = -\frac{q}{2} \pm \sqrt{\frac{q^2}{4} + \frac{p^3}{27}}$$

$$\text{and } \sqrt[3]{u} = \sqrt[3]{-\frac{q}{2} \pm \sqrt{\frac{q^2}{4} + \frac{p^3}{27}}}$$

Whence, since  $b^3u^2 = -q - u$  we shall find

$$b\sqrt[3]{u} = \sqrt[3]{-\frac{q}{2} \mp \sqrt{\frac{q^2}{4} + \frac{p^3}{27}}}$$

and, of consequence

$$x = \sqrt[3]{-\frac{q}{2} \pm \sqrt{\frac{q^2}{4} + \frac{p^3}{27}}} + \sqrt[3]{-\frac{q}{2} \mp \sqrt{\frac{q^2}{4} + \frac{p^3}{27}}}$$

Fourth degree  $x^4 + px^2 + qx + r = 0$

Let  $x = a\sqrt[4]{u} + b\sqrt[4]{u} + c\sqrt[4]{u}$ , or rather (observing that  $\sqrt[4]{u^2} = \sqrt{u}$ , and transposing the term  $b\sqrt[4]{u^2}$ ),  $x - b\sqrt[4]{u} = a\sqrt[4]{u} + c\sqrt[4]{u}$

Squaring each member we shall have

$$x^2 - 2bx\sqrt[4]{u} + b^2u = a^2u + c^2u + 2ac\sqrt{u}$$

or by transposition,

$$x^2 + b^2u - 2ac\sqrt{u} = (2bx + a^2 + c^2u)\sqrt{u}$$

Squaring de novo, putting all in one member, and arranging with respect to  $x$ , we shall find

$$\left. \begin{aligned} x^4 - 4acx\sqrt{u} + 4b^2u^2 - 4b^2u^2 \} x^2 - 4b^2u^2 \} x^2 - 4b^2u^2 \} \\ - 4ab^2u^2 \\ + 2a^2c^2u^2 \\ - c^4u^2 \end{aligned} \right\} = 0$$

This equation being compared with the proposed one, and equating respectively the corresponding terms, we have

$$x^2 - 4b^2u^2 = x^2 - 4b^2u^2 = q, \text{ or } 4b^2u^2 = -q$$

There are four quantities  $a, b, c, u$ , and only three equations,  $x^2 - 4b^2u^2 = -q$ ,  $x^2 - 4b^2u^2 = -q$ , and  $x^2 - 4b^2u^2 = -q$ , then we shall have the three equations,  $x^2 - 4b^2u^2 = -q$ ,  $x^2 - 4b^2u^2 = -q$ , and  $x^2 - 4b^2u^2 = -q$

The first gives  $u = -\frac{q}{4b^2}$ , or  $u = -\frac{q}{4b^2}$ , and  $4b^2u^2 = -q$

The second gives  $a^2 + c^2u = -\frac{q}{4u}$ , and consequently

$$\text{ly } u(a^2 + c^2u)^2 = \frac{q^2}{16u}, \text{ whence we have}$$

$$-a^4u - c^4u^3 + 2a^2c^2u^2 = -\frac{q^2}{16u} + 4a^2c^2u^2 = -\frac{q^2}{16u} +$$

$\frac{1}{4}(p + 2u)^2$  Substituting this value and that of  $4ac\sqrt{u}$ , in the third equation, we shall find after due reduction

$$u^3 + \frac{pu^2}{2} + \frac{(p^2 - 4r)u}{16} - \frac{q^2}{64} = 0, \text{ or}$$

making  $u = \frac{1}{4}t$ ,

$$t^3 + 2pt^2 + (p^2 - 4r)t - q^2 = 0$$

This is an auxiliary cubic equation, from which finding  $t$  (see Cubics), we easily ascertain  $u$ ; then we may determine  $a$  and  $c$  by means of the equations  $-4ac\sqrt{u} - 2u = p$ ,  $-4u(a^2 + c^2u) = q$  From which the four roots of the original equation become known See Biquadratics

A farther development of this method may be found in *Nouveaux Memoires de l'Academie de Petersbourg*, tome IX

## Bezout's Method

The researches of M Bezout on equations in general, have considerably extended the class of equations susceptible of a complete resolution It is the principal object of one of his Memoirs, published among those of the French Royal Academy, in 1762 After having expounded his views on the means of arriving at a general resolution and having made the application to cubic equations, he proposes this problem Having given an equation

such as  $x^n + px^{n-2} + qx^{n-3} + rx^{n-4}, \&c + M = 0$ , to find the conditions between its coefficients which will reduce it to an equation of the same degree  $y^n + h = 0$  For this last equation is always susceptible of complete solution To this effect he supposes  $y = \frac{a+z}{b+z}$ , which gives a new complete equation of the

degree  $n$  in  $z$ , whose coefficients are functions of  $a$  and  $b$ , of which the progression is regular and elegant This equation, which is named auxiliary, serves to find the value of  $h$  and those of  $a$  and  $b$ , which are the two roots of the equation of the second degree  $u^2 - \frac{3qa}{(n-1)p}u - \frac{2p}{n(n-1)} = 0$  If

now  $r$  the coefficient of the following term of the given equation be equal to that of the corresponding term of the auxiliary equation, given in  $a$  and  $b$ , which are known, the next following to the next, and so on, the two equations will be absolutely equal We shall, therefore, obtain the root at once, by means of the equation  $y^n = -h$ , or  $y^n = -\frac{a}{b}$ , since  $h = \frac{a}{b}$ , and  $y = \sqrt[n]{-\frac{a}{b}}$  This value being substituted in the equation  $y = \frac{a+z}{b+z}$ ,

gives a value of  $x$  equal to the sum of  $n-1$  mean proportionals between  $a$  and  $b$

Thus, for example, in the equation of the fifth degree  $x^5 + px^3 + qx^2 + rx + t = 0$  whatever  $p$  and  $q$  may be, if  $r$  (the coefficient of  $x$ ) is found equal to the corresponding term of the auxiliary equation, namely,  $\frac{1}{2}(n-1)\frac{1}{2}(n-2)\frac{1}{2}(n-3)ab(a^2 + ab + b^2)$ , we shall have  $x$  or, to speak more correctly, one of the values of  $x = \sqrt[5]{\frac{a^4b^4}{2ab^4}}$  And these four quantities are the four mean proportionals between  $a$  and  $b$

As we obtain by this method only one value of  $y$ , and consequently of  $a$ , and as we require as many roots as there are units in  $n$ , the Memoir

above cited, shews how the others may be found by means of the multisection of the circle, or of the celebrated COTESIAN theorem. But what we have here explained must suffice for a concise view of the general method.

#### 4. Methods of Elimination

Methods of elimination or extermination, are sometimes useful in depressing the dimensions of equations. Thus, suppose there were given the two equations:

$$(1). \quad ax^3 + bx^2 + cx = d.$$

$$(2). \quad px^3 + qx^2 + rx = s.$$

If equa. (1) be multiplied by the second coefficient of  $x^3$ , and equa. (2) by the first coefficient of that quantity, we should have

$$(3). \quad apx^3 + bpx^2 + cpx = dp$$

$$(4). \quad apx^3 + arx^2 + ax = as$$

Whence, by subtraction, there would result

$$(5). \quad (bp - ar)x^2 + (cp - ax)x = dp - as$$

A quadratic equation easily resolvable by the common methods. And in like manner we might reduce two analogous biquadratics to a cubic, and so on.

When the sum, sum of the squares, sum of the cubes, &c. of any number of quantities are given, the following general method will be found very simple and convenient.

In all equations where the quantities are equally concerned, and all the signs affirmative, the roots of the final equation are the values of all the unknown quantities, and since an equation has as many roots as dimensions therefore by assuming an equation with unknown co-efficients, and of as many dimensions as the number of unknown quantities, it is plain, that by determining those co-efficients, the roots of such equation will be the quantities required. Now, it is known that the co-efficient of the second term is equal to the sum of the roots with a contrary sign, of the third, the sum of the rectangles, of the fourth, the sum of the solids, &c. putting  $a, b, c, \&c$  for the sum of the quantities, sum of the squares, sum of the cubes, &c. and  $A, B, C, \&c$  for the sum, sum of the rectangles, sum of the solids, &c. we find

$$A = a, B = \frac{-b + a^2}{2}, C = \frac{c - ab + a^2}{3},$$

$$D = \frac{-d + ac - bB + aC}{4}, E = \frac{e - ad + cB - bC + aD}{5},$$

$$F = \frac{-f + ae - dB + cC - bD + aE}{6}, \&c \text{ from which}$$

the law of continuation is manifest, the denominators proceeding in the order 1, 2, 3, 4, &c. and the number of terms in the numerator equal to their corresponding denominators also, the first terms of the numerators of  $A, B, C, \&c$  are  $a, -b,$

**ALGEBRAICAL**, a relating to algebra as algebraical characters, solutions, curves, &c.

**ALGEBRAICAL CURVE**, is a curve in which the general relation between the abscissa and the ordinates may be defined by an algebraical equation. These are also called geometrical lines, or curves, in contradistinction to mechanical or transcendental ones.

**ALGEBRAIST**, a person skilled in algebra.

**ALGEDO**, (from  $\alpha\lambda\gamma\alpha\varsigma$ ,  $\rho\alpha\iota\iota$ ), a term appropriated to express any violent pain about the anus, perineum, testes, urethra and bladder, arising from an abrupt suppression of a gonorrhoeal discharge.

**ALGEMA**, ( $\alpha\lambda\gamma\eta\mu\alpha$ , from  $\alpha\lambda\gamma\omega$ , to be in pain), a medicine of pain of any kind.

$c, -d, \&c$  respectively, the second terms of  $B, C, D, \&c$  are  $a^2, -ab, ac, -ad, \&c$  respectively, found by multiplying  $a$  into each of the terms above; the third terms of  $C, D, E, \&c$  are  $aB, -bB, cb, \&c$  or  $B$  into each of the first terms aforesaid, the fourth terms of  $D, E, F, \&c$  are  $C$  into each of the said first terms respectively, &c. &c. Or, the  $n$ th coefficient will be

$$= \pm \frac{-p + aq - rB + sC - tD + \&c \text{ to } n \text{ terms,}}{n}$$

where  $p$  is put for the  $n$ th letter of  $a, b, c, \&c$   $q$  for that next preceding,  $r$  for the next preceding that again, &c. and the affirmative or negative sign must be taken according as  $n$  is an even or an odd number. From this expression any of the required coefficients may be easily determined.

**Ex 1** Given  $\begin{cases} y + z = 5 (a) \\ y^2 + z^2 = 13 (b) \end{cases}$  to find  $y$  and  $z$

Let  $mn - \Lambda m + B = 0$ , be an equation whose two roots are the values required; then  $A (=a) = 5$ ,  $B (= \frac{a^2 - b}{2}) = 6$ , and therefore  $m^2 - 5m + 6 = 0$ , and the roots 2 and 3 are the numbers required.

**Ex 2**  $\begin{cases} w + x + y + z = 14 (a) \\ w^2 + x^2 + y^2 + z^2 = 54 (b) \\ w^3 + x^3 + y^3 + z^3 = 224 (c) \end{cases}$  to find the values of  $w, x, y, z$

Let  $m^4 - \Lambda m^3 + Bm^2 - Cm + D = 0$ , be an equation whose four roots are the values required; then,  $A (=a) = 14$ ,  $B (= \frac{a^2 - b}{2}) = 71$ ,

$C (= \frac{c - ab + aB}{3}) = 154$ ,  $D (= \frac{ac - bB + aC - d}{4}) = 120$  therefore  $m^4 - 14m^3 + 71m^2 - 154m + 120 = 0$ , and the roots 2, 3, 4, and 5 the values sought.

**Ex 3**  $\begin{cases} v + w + x + y + z = 20 (a) \\ v^2 + w^2 + x^2 + y^2 + z^2 = 90 (b) \\ v^3 + w^3 + x^3 + y^3 + z^3 = 440 (c) \\ v^4 + w^4 + x^4 + y^4 + z^4 = 2274 (d) \\ v^5 + w^5 + x^5 + y^5 + z^5 = 12000 (e) \end{cases}$  to find  $v, w, x, y, z$

Let  $m^5 - \Lambda m^4 + Bm^3 - Cm^2 + Dm - 1 = 0$  be an equation whose five roots are the values required, then, working as in the preceding examples, we shall find  $A = 20$ ,  $B = 155$  ( $= 580$ ),  $D = 1044$ , and  $E = 720$ , therefore  $m^5 - 20m^4 + 155m^3 - 580m^2 + 1044m - 720 = 0$ , and the roots 2, 3, 4, 5, and 6, the values required.

For information on various subjects connected with Algebra, the reader may farther consult the articles *APPLICATION of Algebra to Geometry*, *APPROXIMATION*, *BINOMIAL*, *BIQUADRATICS*, *CUBICS*, *CURVES*, *DEPRESSION*, *DIOPHANTINE*, *EXPEDIENT*, *ROOT*, *SERIES*, &c.

**ALGIBNEB**, or **ALGIBNIB**, a fixed star of the second magnitude, in Pegasus's right side, marked  $\alpha$  by Bayer.

**ALGLROTH**, (from *Alceroth*, the name of its inventor, a physician of Verona.) The mercurius vitæ, or antimonial part of butter of antimony, separated from some of its acid by washing it in water.

**ALGIABARII**, a Mahometan sect of predestinarians.

**ALGID**, (*algidus*, from *algere*, to be cold,) chilled cold, numbed.

**ALGIDITY**, *a.* Chills; cold.

**ALGIERS**, a kingdom of Africa, now one of the states of Barbary. It extends 460 miles in length from east to west, and is very unequal

In breadth, some places being scarce 40 miles broad, and others upwards of 100. It is bounded on the N by the Mediterranean, on the E. by the River Zaine, the ancient Tusca, which divides it from Tunis, on the W by the Mulvya, and the mountains of Trava, which separate it from Morocco; and on the S by the Sahara, Zaara, or Numidian desert. The Algerine kingdom made formerly a considerable part of the Mauritania Tingitana, which was reduced to a Roman province by Julius Cesar, and from him also called Mauritania Caesariensis.

**ALGIERS**, a city, the capital of the above kingdom, and probably the ancient Icosium by the Arabians called *Algezair*, or rather *Al-Jezair*, i. e. the island, because there was an island before the city, to which it hath been since joined by a mole. The number of its inhabitants is said to be about 100,000 Mahometans, 2500 Jews, and 1500 Christians. Lat. 36.30 N. Lon. 2. 13 E.

**ALGIFIC**, *a* (from *algor*, Lat.) That produces cold.

**ALGOL**, the fixed star in Caput Medusæ, and marked  $\beta$  in Perseus. This star is subject to periodic variations in its brightness. It changes from the second magnitude to the fourth in about three hours and a half, and back again in the same time; when it continues in the greatest brightness for about two days and seven hours, then it changes again. Lat. 1793 Mr Goodricke and others have speculated upon the cause of these variations, but their conjectures are not worth detailing.

**ALGOMEYSA**, in astronomy, the same as *Procyon*.

**ALGOR**, (*algeo*, to be cold) Chilliness or rigor. A disease enumerated in the nosologies of Sauvages and Sagar.

**ALGORAB**, a star of the third magnitude, marked  $\delta$  in Corvus.

**ALGORITHM**, **ALGORISM**, Arabic words expressive of numerical computation. They are now generally used to denote the radical and operative part of either arithmetic or algebra.

**ALHABOR**, among Arabian astronomers, the star commonly called Sirius.

**ALHANDAL**, (*alhandel*, Arab.) The colic, or bitter apple.

**ALHAZEN**, **ALLACEN**, or **ABDILAZUM**, was a learned Arabian, who lived in Spain about the year 1100, according to his editor Bædæ and Weidler. He wrote upon astronomy, and his work upon optics was printed, in Latin, at Basil, in 1572, under the title of *Opticæ Theorica*, by Hieron. Alhazen was a man who showed the importance of refractive astronomy, so little known to the ancients. He is the first author who has treated of the subject in which he wrote, and he has given us the first principles of the science.

**ALIAS**, in law, a second writ, sometimes the second writ, after a first writ, is issued without effect.

**ALIA**, in law, a second writ, sometimes the second writ, after a first writ, is issued without effect.

**ALII**, gives the denomination to a sect, or division, among the Mahometans, who adhere to the right of succession to Ali, the fourth caliph, or successor of Mahomet, and the reform of musulmanism introduced by him.

The sectaries of Ali are more particularly called *Schites*, and stand opposed to the *Sunnites*, or sect of Omar, who adhere to the law as left by Mahomet, Abubeker, and Omar.

Ali was cousin of Mahomet, and son-in-law of that prophet, having married his daughter Fatimah. After Mahomet's death, great disputes arose about the succession, manifested for Ali, but Abubeker was preferred, and elected the first caliph. Ali took his turn, after the death of Othman.

This Ali, sitting one day with a company of young men who were conversing on the elegance and pleasantness of different things; when it came to his turn to speak, said, "The handsomest dress is a coat of mail, and the best covering for the head, is a helmet; the pleasantest beverage is the blood of our enemies, the most agreeable shade is that of spears, the most delightful music is the neighing of the caparisoned war-horse, and the most estimable companions, are warriors and valiant heroes." This blood-thirsty sublimity would have done honour to him "who was a murderer from the beginning, rather than to the founder of a sect, even of Mahometans. This Ali, likewise called *Lion of God*, composed some verses in the same mild spirit, from which we select the following.

"The sword and the hanger are my fragrant bowers

Despicable in my judgment are the narcissus and myrtle [enemies,

Our wine is made from the blood of our And our cups are formed out of their skulls."

A literary gentleman connected with the *Eclectic Review*, exclaimed on reading these verses, "Bravo! Lion of God, true son of Apollyon!"—Tisiphone herself cannot match this saying. The man whose ruthless soul was capable of framing it bids far to be devil when Satan dies!"

**ALIA**, *alia*, in Grecian antiquity, solemn games celebrated at Rhodes, on the 24th day of the month Gorpizea, corresponding to the Athenian Boedromion, in honour of the sun, *helios*, or *alios*, who is said to have been born there.

**ALIA SQUILLA**, (from *alia*, marine, and *squilla*, a shrimp) The prawn or sea-shrimp.

**ALJAMRIA**, is a name which the Moriscoes in Spain gave to the language of the Spaniards.

**ALLAS** and **ALLA** Latin word, signifying otherwise, as Mallet, alias Malloch; that is, otherwise Malloch.

**ALLAS**, in law, a second writ, sometimes the second writ, after a first writ, is issued without effect.

**ALIBI**, in law, denotes the defence of the



from the place where he is charged with having committed a crime, or his being charged at the time specified.

**ALIMENTA** *a. (alimenta, Lat.)* Nutrients, nourishments that may be nourished.

**ALICANT** *a. (alicant, Fr.)* A port town of Valencia, in Spain, famous for its harbour, which is defended by strong bastions. Lat 38 24 N. Lon. 0 36 W.

**ALICANT** *a. (alicant, Lat.)* In ancient history, prostitutes.

**ALICUDA** or **ALICUR**, one of the Lipara islands near the coast of Sicily. Lat 38 21 N. Lon 14 32 E. This island is about six miles in circuit, and has about 650 inhabitants, who are fishermen and farmers, and extremely indolent. The most interesting account of this island we know, is to be found in the third volume of Spallanzani's Travels in the Two Sicilies.

**ALICULA**, in antiquity, a habit worn by the Roman children.

**ALIBADE**. See **ALIBADIS**.

**ALIEN** *a. (alienus, Lat.)* 1 Foreign, or not of the same family or land (*Dryden*) 2 Estranged from; not allied to (*Rogers*)

**ALIEN'S** (*alienus, Lat.*) 1 A foreigner, not a denizen; one not allied, a stranger (*Ad*)

**ALIEN**, in law, a person born out of the king's allegiance, in contradistinction to a denizen, or natural subject. The word is formed from the Latin alias, "another," and one born in another country. An alien is incapable of inheriting lands in Britain till naturalized by an act of parliament. No alien is entitled to vote at the election of members of parliament, nor can he enjoy any office, or be returned on any jury, unless where an alien is party in a cause, when the inquest is composed of an equal number of denizens and aliens.

The reasons for establishing these laws were, that every man is presumed to bear faith and love to that prince and country where he received protection during his infancy, and that one prince might not settle spies in another's country, but chiefly, that the rents and revenues of the country might not be drawn to the subjects of another. Some have thought that the laws against aliens were introduced in the time of Henry II. Others that it is an original branch of the feudal law for by that law no man can purchase any lands but he must be obliged to do fealty to the lords of whom the lands are holden, so that an alien who owed a previous faith to another prince, could not take an oath of fidelity in another sovereign's dominions. Among the Romans, only the Cives Romani were esteemed freemen, but when their territories increased, all born within the pale of the empire were considered as citizens.

**ALIEN DUTY**, an impost laid on all goods imported by aliens, over and above the customs paid for such goods, imported by British and our British bottoms.

**ALIEN** *a. n. (alienor, Fr. alieno, Lat.)* 1 To make any thing the property of another (*Fraser*). 2 To estrange; to turn the mind of the mind, to make averse (*Clarendon*).

**ALIENABLE** *a. (from To alienate.)* That of which the property may be transferred (*Denon*).

**TO ALIENATE** *v. a. (alienor, Fr. alieno, Lat.)* 1 To transfer the property of any thing to another (*Bacon*) 2 To withdraw the heart or affections (*Full*)

**ALIENATE** *a. (alienatus, Lat.)* Withdrawn from, stranger to (*Sneyt*).

**ALIENATIO MENTIS**, ALIENATION OF MIND. See **DELIRIUM**.

**ALIENATION** (*alienatio, Lat.*) 1 The act of transferring property (*Atterb.*). 2 The state of being alienated. 3 Change of affection (*Bacon*) 4 Disorder of the faculties (*Hooker*)

**ALIENATION**, **ALIENATIO**, in law, the act of making a thing another man's, or the altering and transferring the property and possession of lands, tenements, or other things, from one man to another. To alienate, or alien, in mortmain, is to make over lands or tenements to a religious community, or other body politic. To alienate in fee, is to sell the fee-simple of any land, or other incorporeal right. All persons who have a right to lands, may generally alien them to others, but some alienations are prohibited, such as alienations by tenant for life, &c. whereby they incur a forfeiture of their estate. 1 Inst. 118.

**ALIENOUS**, **ALIENUS**, (*alieno, to estrange*) In medicine, any thing foreign to the sound properties of the body.

**ALIFORM**, (*aliformus, from ala, a wing, and forma, a likeness*) Winglike, pennate, pinnated.

**ALIFORMES MUSCULI**. See **PERIMYOGOID MUSCLES**.

**ALIMENT**, (*from alo, to nourish*) implies food both solid and liquid, from which, by the process of digestion, chyle is prepared, and this being absorbed by the lacteal vessels, and conveyed into the circulation, is there accumulated into the nature of blood, so as to afford that supply of nutrition which the continual waste of the body is known to require.

**ALIMENTAL** *a. (from aliment)* That has the quality of aliment, that does nourish, that does feed (*Brown*).

**ALIMENTARIUM PUERI**, &c. were certain children maintained and educated by the munificence of the Roman emperors, in a sort of public places, not unlike our hospitals.

**ALIMENTARINESS** *s. (from alimentary)* The quality of being alimentary.

**ALIMENTARY** *a. (from aliment)* 1 That belongs to aliment (*Arbutnot*) 2 That has the power of nourishing (*Ray*).

**ALIMENTARY DUCT**, a name by which some call the intestines, because the food passes through them.

**ALIMENTATION** *a. (from aliment)* 1 The quality of nourishing, or the state of being nourished.

**ALIMENTION** *a. (from aliment)* The quality of being alimentary.

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## ALI

modern sense, in law, it denotes that portion, or allowance, which a married woman sues for, upon any occasional separation from her husband, wherein she is not charged with elopement or adultery.

**ALINDESIS**, in ancient gymnastics, an exercise in which persons besmear'd themselves all over with oil, and then rolled about, naked, in the dust.

**ALIPILARIUS**, in Roman antiquity, an attendant at the baths, who took off the hairs from persons' arms, legs, &c. this being deemed a point of cleanliness.

**ALIPTA**, an officer anciently appointed to anoint the athletes. Hence we have **ALITERIUM**, the place where this anointing was performed.

**ALIPTES**, the name of a fountain near Ephesus.

**ALIQUNT PART**, in arithmetic, is that number which cannot measure any other exactly without some remainder. Thus 7 is an aliquant part of 16, for twice 7 wants 2 of 16, and 3 times 7 exceeds 16 by 5.

**ALIQUT PART**, is that part of a number or quantity which will exactly measure it without any remainder. Thus 2 is an aliquot part of 4, 3 of 9, 4 of 16, &c. All the aliquot parts of any number may be thus found. Divide the given number by its least divisor, then divide the quotient also by its least divisor, and so on, always dividing the last quotient by its least divisor, till the quotient 1 is obtained, and all the divisors, thus taken, are the prime aliquot parts of the given number. Then multiply continually together these prime divisors, viz. every two of them, every three of them, every four of them, &c., and the products will be the other or compound aliquot parts of the given number. So if the aliquot parts of 60 be required, first divide it by 2, and the quotient is 30. then 30 divided by 2 also, gives 15, and 15 divided by 3 gives 5, and 5 divided by 5 gives 1. so that all the prime divisors or aliquot parts are 1, 2, 3, 5. Then the compound ones, by multiplying every two, are 4, 6, 10, 15, and every three, 10, 20, 30. So that all the aliquot parts of the given number 60, are 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30.

**ALISE**, or **ALESIA STE RFIAL**, in geography, a small town of France, in the department of the Cote d'Or, eight miles N E. of Semur-en-Auxois. This town was the ancient Alesia.

**ALISH** *a* (from *ale*) Resembling ale (*Alor*).

**ALISMA** Water plantain. A genus of the class and order hexandria, polygynia. Calyx three-leaved, petals three, capsules numerous, aggregate, mostly one-seeded. It comprises 10 species traced in different parts of Europe, Africa, and America three of which are inhabitants of the swamps and pools of our own country.

**ALPINES**, (*alpe*, from *alpe*)

**ALPURA**, **ALPURA**, (*alpe*, from *alpe*)

## ALK

**ALIVE** *a* (from *a* and *live*) 1 In the state of life, not dead (*Dryden*) 2 Untinglashed, undestroyed; active, in full force (*Hooker*) 3 Cheerful, brightly (*Clarendon*) 4 It is used to add an emphasis: as, the best man *alive* (*Clarendon*)

**ALKAHEST**, or **ALCAHEST**, among alchymists, a universal menstruum, or a liquor which has the power of resolving all things into their first principles. The word was invented by Paracelsus, and applied by him to a remedy which he asserted to be sovereign against the dropsy, and all diseases of the liver; but his pupil Van Helmont, desirous of exalting its fame, ascribed to it such wonderful properties as excite credulity. He pretended that it was capable of dissolving all substances into a liquor, which rises wholly in distillation, leaving no faces behind, at the same time that the alkahest itself spontaneously separates from the body on which it has produced so remarkable a change. The substances thus acted upon retain, however, their essential properties, but by further digestion with the alkahest, are all resolved into the same scentless, insipid, clementary water.

With the secret of preparing this extraordinary liquor, Helmont professed himself to be acquainted, and solemnly affirmed that he once had some of it in his possession. That these pretensions should gain credit, when it is so evident that no such liquor could exist (for no vessel can contain that which is capable of dissolving all things), may appear wonderful, but when we reflect on the extreme ignorance of the age, with respect to physical subjects, on the importance to which the alchymists had raised themselves, and on the extensive utility of such an alkahest, if attainable, and when we consider also that "what men wish they easily believe," we shall be the less surprised at the avidity with which this, and other notions equally absurd, were propagated and received.

**ALKAHEST OF RESPOUR**, a mixture of potash with oxyd of zinc, to which he ascribed the power of dissolving all metals.

**ALKALISTIC**, is sometimes used to denote the quality of bodies that are powerfully solvent. In this sense, it is nearly the same as menstuous, only it expresses a greater degree of solving power.

**ALKALESCENT**, is used to denote a substance slightly alkaline, or in which an alkali is beginning to be formed and to predominate. It is generally applied to the production of volatile alkali, or ammonia, by putrefaction. Some species of vegetables, particularly those of the utradynamic class, are also called alkalinescent, because, when placed in circumstances favourable to fermentation, they have a tendency to produce ammonia, which may be separated by distillation.

**ALKALI**, a general term for an order of salts of great use and importance. There are two kinds of alkalies, the fixed, which have no smell, and the volatile, which have a pungent one of the former kind there are two—Potassa,

# A L K A L I

Potash, or the vegetable fixed alkali, and Soda, or the mineral fixed alkali, of the latter there is but one species, which is called Ammonia.

The word alkali is derived from the Arabic *alkalies*, burnt, and was originally applied to the salt extracted from the ashes of the plant kali, or glass-wort. The same salt is also found native in great quantities, mixed with sea-salt in the waters and on the shores of several lakes of Lower Egypt, and has been known from time immemorial, by the name of natron, or the nitre of the ancients. The Greeks and Romans called the fixed alkali, luxuriary salt, because they obtained it by lixiviating the ashes of certain vegetables.

The general properties of alkalies, which are common to them all, are the following — 1 A peculiar acrid taste, which acts with so much energy as to corrode the tongue. 2 The power of changing the blue colours of vegetables green from this, however, there are deviations, for they change the red of archil or litmus to a blue, and the yellow of turmeric, as well as the light brown of many roots and wood, to a dull red. 3 They are highly soluble in water, giving out heat on their union. 4 They corrode woollen cloth, and if strong, reduce it to the form of a jelly. 5 They render oils miscible with water, by uniting with them, and forming with them the well known compound, soap. 6 Combined with sulphur they form alkaline hepar, or livers, now called alkaline sulphurets. 7 With the acids they form neutral salts, of different degrees of solubility, these are distinguished by different names, according to the acid and the alkali employed, thus, a salt formed by the union of sulphuric acid with potash, is called sulphat of potash, that composed of nitric acid and soda, is called nitrate of soda, and so on.

Beside these characteristic properties of alkalies, each species possesses others peculiar to itself, the most material of which we shall state, referring for more particular information to the separate articles Potash, Soda, Ammonia.

The fixed alkalies are so called because they are not volatilized without an intense heat\* they melt, however, with a moderate degree of heat, and, uniting with earthy substance, form glass. They will also dissolve by heat all the metallic oxyds, and assist in the fusion of all earthy and metallic mixtures. When pure and solid, they are remarkably deliquescent, absorbing water from the atmosphere or any surrounding medium, so that they are sometimes used to render the air of vessels perfectly dry. Both the fixed alkalies, Potash and Soda, have these

properties; but with some variation, which can scarcely be observed when both are in a state of purity. It is only in their combinations that the difference of their natures can be distinguished. From these combinations it appears that they differ from each other in the strength of their affinity with acids, which is greater in the former, in a slight degree in their action on oils and animal fats, but chiefly in the neutral salts which they produce with acids, which in all cases differ in form of crystallization, in solubility, often in taste, and in several other particulars.

Potash is called the vegetable alkali, because it is procured from the ashes of all vegetables, in a greater or less proportion, except marine plants, and a few that grow near the sea-shore, which yield soda. This latter is termed the mineral alkali, because it is not only obtained from the ashes of the last-mentioned plants, but is sometimes found native in the earth. Potash is also formed by the burning of tartar, hence called salt of tartar, but the purest of all is obtained from the deflagration of nitre — the charcoal uniting with the acid as it assumes the form of oxygen gas, and the alkali being left behind. The most common alkali, but the least pure, is that of the ashes of common hearths, where wood is burnt. The ashes of horse-chestnuts contain a large quantity of it. Deyeux and Vauquelin assert that a pound of these ashes will yield more than six ounces of potash, and that the same quantity of burnt husks affords nearly as much. It appears, however, that the fruit of the Spanish hick, or *avringa vulgaris* of Linneus, contains the greatest quantity of this alkali, for according to the above-mentioned chemists, its ashes will yield pure alkali in the proportion of eight ounces and three drachms to a pound. — The dry leaves of the beech-tree, also, afford potash in great abundance. M. Jacobson asserts that ten pounds weight of the ashes thence obtained will furnish as much as thirty pounds will of common wood-ashes. — Soda is found in the ashes of sea-weed. It is likewise the basis of sea salt, from which it is separated by several processes, but especially by the oxyd of lead, which has a stronger affinity for the muriatic acid with which the soda is found combined. When exposed to atmospheric air, it attracts its moisture, (like potash), and the peculiar acid it contains, so as to become gradually a neutral salt, but if the atmosphere be dry, the alkali loses its water, and then it is said to effloresce. In this state it is often found on old walls. The uses of soda, like those of potash, are very great in the making of glass, soap, &c. It has also been lately prepared and sold in a proper form for washing linen.

With respect to the intimate nature of the fixed alkalies, chemists are yet ignorant.

\* This is true of those alkalies, in their usual state, combined as they are with carbonic acid and other substances, but in a state of purity, Mr. Chenevix has frequently volatilized soda in a good red heat, and potash, he says, is still less fixed. It is, therefore, very questionable whether the designation imposed upon them when they were imperfectly known, ought to be continued. It would, however, be improper for us to omit the term in a work designed for reference, as it is employed in almost every publication on chemistry.

† Though a very valuable apparatus appears to be made towards a discovery of their nature by a series of electric experiments lately made upon them by Mr. Davy, and which it is our intention to notice at length in the article Gases, that we may give one connected view of the whole.

**ALK**

qualities that so much distinguish the alkalis. These earths are barytes, magnesia, lime, and strontian, whose saline properties generally predominate over their earthy ones.

ALKALINE SALTS, in common language, are the alkalis themselves, considered in a medical point of view, they are known to possess antiseptic powers. When regarded more strictly as alkaline neutral salts, they are combinations of alkalis with acids, their number is equal to the product of the number of acids, and three, the number of alkalis.

ALKALINE SULPHURES, or SULPHURETS, called also alkaline liver of sulphur, are combinations of sulphur with each of the alkalies. For an account of them, see SULPHURET OF POTASH, OF SODA, and of AMMONIA.

Alkalies are either mild, or caustic. In the first state they are combined with fixed air, or carbonic acid gas, which moderates their action, and at which occasions them to effervesce with acids—a character formerly thought to be essential to alkalies in general, but now known to depend upon the expulsion of the acid to which they are united. In their second or caustic state, the carbonic acid is separated from them by lime, which thus renders them more pure and increases the energy of their action. All the mild or effervescent all thes, then, in the new nomenclature, are really carbonates of potash, soda, or ammonia, and the caustic alkalies are the only ones that exist in a state of purity. See CARBONATE

**ALKALIZATION**, is also a name applied to operations, by which alkaline properties are communicated to bodies, or to those by which alkali is extracted from bodies which contain it or in which it may be formed, e. g. spirit of wine is said to be alkalinized, when it has been digested upon alkali, a part of which it dissolves, and thence acquires alkaline properties. On the other hand, when a neutral salt is decomposed in order to obtain its alkaline basis, this salt is said to be alkalinized. Vegetable substances, when reduced to ashes, may also be said to be alkalinized, because these ashes contained fixed alkali.

ALKALI, FLUOR, a solution of pure ammonia in water

ALKALIZATE *a* (from *alkali*) Having the qualities of alkali (*Newton*)

**ALKALI, PHLOGISTIC OF PRUSSIAN**, is prepared by calcining carbonat of potash with bullock's blood or other animal matter, in which process it unites with the prussic acid formed during the calcination. See PRUSSIAN OF POTASH AND IRON.

**ALKANET**, in botany See **LITHOSPERMUM**

**ALKALI OF TARTAR, OR SALT OF TAR-**  
**TAR,** a mild vegetable fixed alkali, prepared by  
the combustion of tartar. The name is ap-  
plied to any pure carbonat of potash, in com-  
mon language and in medicine.

AI KANNA      SEC ANCHUSA

**ALKANNA VERA** *Alkanna orientalis* An oriental plant, the *Lawsonia inermis*, ramis inermis, of Linneus, principally employed in its native place as a dye. The root is the official part, which, however, is rarely met with in the shops. It possesses astringent properties, and may be used as a substitute for the anchusa.

ALKALI, in botany See SALICORNIA  
ALKALINE, in a general sense, something  
that has the properties of an alkali

ALKARVA, (*alkarvah*, Arab) The herb ricinus or palma Christi, from the seeds of which is made the castor oil

**CLAYEUSES** or salino-terrene sub-  
jects called by Fourcroy, are those  
which consist both of earths and  
of saline matter, the earths which  
are soluble in boiling water, in water,  
or in alcohol, and which, according to  
Fourcroy, are the property of changing in colour  
from white and red to a variable colour, of ap-  
pearing as an acid with eagerness, and of  
being, when pure, those caustic or acrid

**ALKEKENGİ, (alkekengi, Arab)** Halicabacum Winter cherry This plant, physalis alkekengi, folius geminis integris acutis, caulibus herbaceis, inferne subramosis, of Linnæus, is cultivated in our gardens. The berries are recommended as a diuretic, from six to twelve for a dose, in dropsical and calculous diseases. See **PHYSALIS**

**ALKERMES**, in pharmacy, a compound cordial confection, made of various ingredients.

## A L L

as rose-water, sugar, cinnamon, sloes-wood, &c but the principal one is kermes. It is now disused.

**ALKES**, or **ALCES**, the star marked  $\alpha$  in Crater.

**ALCOHOL**, or **ALKOOL**. See **ALCOHOL**.

**ALKORAN**. See **ALCORAN**.

**ALKUSSA**, in ichthyology, a species of salarus.

**ALKY OF LEAD**, among alchemists, a sweet substance procured from lead.

**ALL**,  $a$  (all, Saxon) 1 The whole number, every one (*Lilliotson*) 2 The whole quantity, every part (*Locke*)

**ALL**  $s$  1 The whole (*Prior*) 2 Every thing (*Shakspeare*)

**ALL**, *ad* (See **ALL**  $a$ ) 1 Quite, completely (*Locke*) 2 Altogether, wholly (*Dry*) *All* is much used in composition.

**ALL-SAINTS**, in the calendar, a festival celebrated on the first of November, in commemoration of all the saints in general this is otherwise called **All-hallows**.

**ALL-SOULS**, in the calendar, a festival held on November the second, in commemoration of all the faithful deceased.

**ALLA**, or **ALLAH**, the name by which the professors of Mahometanism call the Supreme Being. The term *alla* is Arabic, derived from the verb *alch*, to adore. It is the same with the Hebrew *Eloah*, which signifies the Adorable Being.

**ALLIA MADRE**, (Ital) To the Mother. It is to the Virgin Mary, an expression written at the beginning of hymns addressed to the Virgin.

**ALLA SICILIANA**, a musical expression which implies a certain species of air generally written in  $\frac{6}{8}$  or  $\frac{12}{8}$  though sometimes in  $\frac{6}{4}$ . Its principal characteristics are its being in a somewhat slow time, and chiefly moving by alternate crotchets and quavers, if in  $\frac{6}{8}$  or  $\frac{12}{8}$ , and in minims and crotchets, if in  $\frac{6}{4}$ , in either case uniformly having the longest note at the threes or points of accentuation.

**ALLANOID MEMBRANE**, (Membrana allantoidea, from *αλλας*, a sausage, or hog's pudding, and *ιδος*, likeness, because in some brute animals it is long and thick.) A membrane of the fetus, peculiar to brutes, which contains the urine discharged from the bladder. See **Cow**.

**ALLANTOIS**, (from *αλλας*, and *ιδος*) A thin bladder of any kind employed in chemical purposes.

To **ALLAY**  $v$   $a$  (from *alloyer*, Fr) 1 To mix one metal with another, to make it fitter for coinage. In this sense, most authors write *alloy*. (See **ALLOY**) 2 To join any thing to another, so as to abate its predominant qualities (*South*) 3 To quiet, to pacify, to repress (*Shakspeare*)

**ALLAY**  $s$  (*alloy*, Fr) 1 The metal of a baser kind mixed in coins, to harden them, that they may wear less (*Hud*) 2 Any thing which, being added, abates the predo-

## A L L

minant qualities of that with which it is mingled.

**ALI AYER**  $s$  (from *alley*) The person or thing which has the power or quality of allaying (*Harvey*)

**ALLAYMENT**  $s$  (from *alley*) That which has the power of allaying (*Shakspeare*)

**ALL-BEARING**  $a$  (from *ail* and *lean*) Omniparous (*Pope*)

**ALL-CHEFRING** ( $a$ , from *all* and *cheer*) That gives gaiety to all (*Shakspeare*)

**ALLCHURCH**, a village of Warwickshire, once seven miles in circumference. The Roman Ickneld-street passes through it. This village was formerly a borough, and had a market, and several streets, the names of which are now lost. The bishop of Worcester had formerly a palace here, and the church, several parts of which are of Saxon architecture, contains many antique monuments. It is five miles from Bromsgrove, in the road to Leicester.

**AIL CONQUERING**  $a$  That subdues every thing (*Milton*)

**ALL-DEVOURING**  $a$  (from *all* and *devour*) That eats up every thing (*Pope*)

**ALLEGANY**, or **APPALACHIAN MOUNTAINS**, the general name of a long range of mountains in North America, between the Atlantic, the Mississippi, and the Lakes. They extend north-easterly and south-westerly, nearly parallel with the sea coast, about 600 miles in length, and from 60 to 200 in breadth. The different ridges which compose this immense range have different names, in the different states. Advancing from the Atlantic, the first ridge in Pennsylvania, Virginia, and North Carolina, is the Blue Ridge, or South Mountain, from 130 to 200 miles from the sea, and about 4000 feet high from its base. Between this and the North Mountain, spreads a large fertile vale. Next lies the Allegany, which is the principal ridge, and has been descriptively called the back-bone of the United States. Beyond this is the long ridge called the Laurel Mountains, in a spur of which, in lat  $36^{\circ}$ , is a spring of water, fifty feet deep, very cold, and as blue as indigo. From these several ridges proceed innumerable nameless branches or spurs. The Kittatiny, or Blue Mountains, run through the northern parts of New Jersey and Pennsylvania. The general name for these mountains seems not yet to have been determined. Mr Evans, an American geographer, calls them the Endless Mountains. Others have called them the Appalachian, from a tribe of Indians, who live on a river proceeding from the ridge, called the Appalichikola. But the most common, and, no doubt, the most proper name, is the Allegany Mountains, as called from the principal ridge. These mountains are not confusedly scattered and broken, rising here and there into high peaks, and stopping each other, but stretch along in long ridges, scarcely half a mile high. They spread as we proceed south, and some of them terminate in high perpendicular bluffs. Others gradually subside into a level country, giving rise to the rivers which run southerly into the gulf of Mexico.

**ALLEGATION** *s* (from *allege*) 1 Affirmation, declaration 2 The thing alleged or affirmed (*Shakspeare*). 3 An excuse; a plea (*Pope*)

**Ta'ALLE'GE** *v a* (*allego*, Latin) 1 To affirm, to declare, to maintain 2 To plead as an excuse, or argument (*Locke*)

**ALLEGABLE** *a* (from *allege*) That may be alleged (*Brown*)

**ALLEGES**, a stuff manufactured in the East Indies, sometimes of cotton, at others of herbs spun like flax

**ALLEGEMENT** *s* (from *allege*) The same with *allegation*

**ALL'GER** *s* (from *allege*) He that alleges (*Bayle*)

**ALLEGIANCE**, in law, is the tie which binds the subject to the king, in return for that protection which the king affords the subject. The thing itself, or substantial part of it, is founded in reason and the nature of government, the name and the form are derived to us from our Gothic ancestors. In Britain, on its becoming a settled principle of tenure, that all lands in the kingdom were holden of the king as their sovereign and lord paramount, no oath but that of fealty could ever be taken to inferior lords; and the oath of allegiance was necessarily confined to the person of the king alone. By an easy analogy, the term of allegiance was soon brought to signify all other engagements which are due from subjects to their prince, as well as those duties which were simply and merely territorial, and the oath of allegiance, as administered in England for upwards of 600 years, continued a promise to be true and faithful to the king and his heirs, and truth and faith to bear of life and limb and terrene honour, and not to know or hear of any ill or damage intended him, without defending him therefrom. But, at the Revolution, the terms of this oath being thought perhaps to favour too much the notion of non-resistance, the present form was introduced by the convention parliament, which is more general and determinate than the former, the subject only promising "that he will be faithful and bear true allegiance to the king, without mentioning "his heirs, or specifying in the least wherein that allegiance consists. This oath must be taken by all persons in any office, trust, or employment, and may be tendered by two justices of the peace to any person whom they shall suspect of disaffection. And the oath of allegiance may be tendered to all persons above the age of twelve years, whether natives, denizens, or aliens.

But, besides these express engagements, the law also holds that there is an implied, original, and virtual allegiance, owing from every subject to his sovereign, antecedently to any express promise, and although the subject never swears any oath or engages in form. Allegiance, both express and virtual, is also distinguished by the law, into two species, the former permanent, and the other local; the former being perpetual, the latter temporary.

It seems fairly presumable, that the con-

vention parliament, which introduced the oath of allegiance in its present form, did not intend to exclude all resistance, since the very authority by which the members sat together, was itself the effect of a successful opposition to an acknowledged sovereign.—Again. The allegiance above described can only be understood to signify obedience to lawful commands. If, therefore, the king should issue a proclamation, levying money or imposing any service or restraint upon the subject, beyond what the law authorised, there would exist no sort of obligation to obey such a proclamation, in consequence of having taken the oath of allegiance.—Neither can allegiance be supposed to extend to the king after he is actually and absolutely deposed, driven into exile, or otherwise rendered incapable of exercising the regal office. The promise of allegiance implies, that the person to whom the promise is made continues king, that is, continues to exercise the power, and afford the protection, which belong to the office of king: for it is the possession of these which makes such a particular person the object of the oath.

**ALLEGIAN'T** *a* (from *allege*) Loyal, conformable to the duty of allegiance (*Shakspeare*)

**ALLEGORICAL** **ALLEGORICK** *a* (from *allegory*) After the manner of an allegory, not real, not literal (*Pope*)

**ALLEGORICALLY** *ad* (from *allegory*) After an allegorical manner (*Pope*)

**To ALLEGORIZE** *v a* (from *allegory*) To turn into allegory, to form an allegory, to take in a sense not literal (*Locke*)

**ALLEGORY**, a figure in rhetoric, which consists in choosing a secondary subject having all its properties and circumstances resembling those of the principal subject, and describing the former in such a manner as to represent the latter. The principal subject is thus kept out of view, and we are left to discover it by reflection. There cannot be a finer or more correct illustration than that in Psal lxxx where a vineyard is made to represent God's own people the Jews.

Nothing gives greater pleasure than an allegory, when the representative subject bears a strong analogy, in all its circumstances, to that which is represented. But some writers are unlucky in their choice, the analogy being generally so faint and obscure, as rather to puzzle than to please. Allegories, as well as metaphors and similes, are unnatural in expressing any severe passion which totally occupies the mind. On this account the language which Shakspeare puts into the mouth of Wolsey after his fall, however beautiful, is open to censure.

"This is the state of man to-day he puts forth

The tender leaves of hope, to-morrow blossoms

And bears his blushing honours thick upon him

The third day comes a frost, &c &c

Such an exuberance of allegory and metaphor as we meet with in this speech, never fall from

## A L L

the lips of a man in deep distress, overwhelmed with grief

**ALLEGHANZA**, a small island of Africa, and one of the Canaries, lying to the north of Graciosa, to the north-west of Rocca, and to the east of St Clase. There are several castles to defend the harbour

**ALLEGRI** (Gregorio), a celebrated musical composer, was born at Rome. He became a singer in the pope's chapel, in 1622. His compositions are still retained in the pontifical chapel. The chief is the "Miserere," which is always sung on Good Friday. Pope Clement XIV sent a magnificent copy of it to our present king, in 1773. Allegri died in 1672.

**ALLEGRO**, in music, a word used to denote one of the distinctions of time. Allegro expresses a sprightly, quick motion, the quickest of all excepting presto. The usual distinctions succeed each other in the following order: grave, adagio, largo, vivace, allegro, and presto.

**ALLEIN** (Joseph), the son of Tobias Alein, was born at the Devizes in Wiltshire, in 1633, and educated at Oxford. In 1655 he became assistant to Mr Newton, in Taunton-Magdalen in Somersetshire, but was deprived for non-conformity. He died in 1668, aged thirty-five. He was a man of great learning, and greater charity, preserving, though a non-conformist and a severe sufferer on that account, great respect for the church, and loyalty to his sovereign. He wrote several books of piety, which are highly esteemed, but his *Alarm to unconverted sinners* is more famous than the rest. There have been many editions of this little pious work, the sale of which has been very great, of the edition 1672, there were 20,000 sold, of that 1670, with this title, *A sure Guide to Heaven*, 50,000. There was also a large impression of it with its first title, in 1720, and several of later date.

**ALILENGYON**, a kind of tributary contribution which the rich in ancient times, paid for the poor when absent in the armies.

**ALLELUIAH**, or **HALLELUJAH**, a word signifying, Praise the Lord, to be met with either at the beginning or end of some psalms, such as Psalm cxlv. and those that follow, to the end. Alleluiah was sung upon solemn days of rejoicing, Tobit, chap. xiii. v. 12. It was afterwards transferred from the synagogue to the church, and so much energy has been observed in this term, that the ancient church thought proper to preserve it, without translating it either into Greek or Latin, for fear of impairing the genius and softness of it. The fourth council of Toledo prohibited the use of it in times of Lent, or other days of fasting, and in the ceremonies of mourning.

**ALLELUJAH**, (from הללוהו *hallehoo yah*, the Lord be praised, Heb.) Woodsorrel, so called from its many virtues. **OXALIS**, which see.

**ALLEMANDE**, a grave slow kind of music, invented by the Germans, generally composed in the common time of four crotchets in a bar. In Germany and Switzerland they have a dance also of the same name, which is

## A L L

written in common time of two crotchets to a bar.

**ALLEMANNIC**, in a general sense, something relating to the ancient Germans. The word is also written *Alumannic*, *Alemannic*, and *Alcmanic*. It is formed from *Alcman*, *Alcman*, or *Alamann*, the name whereby the German nation was anciently known. In this sense we meet with *Alcmanian* history, *Alcmanian* language, *Alcmanian* laws, &c. Goldastus, and others, have published collections of writers on *Alcmanian* affairs. *Alcmanian* scriptors.

**ALLEN** (Thomas), a great mathematician, was born at Uttoxeter, in Staffordshire, in 1542, admitted of Trinity college, Oxford, 1561, and took his degree of M.A. in 1567. In 1570, he removed to Gloucester-hall, where he devoted himself chiefly to the study of the mathematics. Robert, earl of Leicester, would have procured him a bishopric, but he declined the offer through his love of retirement and study. That nobleman placed so much confidence in his abilities, as to consult him on the most important affairs of state. He published, in Latin, the second and third books of Ptolemy, "On the Judgment of the Stars," with an exposition. He died at Gloucester-hall, Oxford, in 1632, aged 90 years. Mr Burton, the author of his funeral oration, calls him "the very soul and sun of all the mathematicians of his age," and Seldon speaks of him, as a person of the most extensive learning and consummate judgment, the ornament of Oxford.

**ALLER**, when used by ancient writers, has a superlative signification. So *aller good* is the greatest good.

**ALLER**, a river of Germany, rises in the duchy of Mecklenburg, passes by Luneburg, Zell, &c. and joins the Weser, a little below Verden.

**ALLERION** or **ALFRION**, in heraldry, a sort of eagle without beak or feet, having nothing perfect but the wings. They differ from murets by having their wings expanded.

**ALLESIS**, (*αλλοσις*, from *αλλος*, another.) In medicine, change from sickness to health, recovery.

**ALL-VEURE**, the smallest copper coin struck in Sweden.

**To ALL-VIATE** *v a* (*allevo*, Lat.) To make light, to ease, to soften (*Bentley*).

**ALLEVIATION** *s* (from *allevare*) 1 The act of making light (*South*). 2 That by which any pain is eased, or fault extenuated (*Locke*).

**ALLEY** *s*, (*allée*, Fr.) 1 A walk in a garden (*Dryden*). 2 A passage in a town narrower than a street (*Shakespeare*).

**ALLEYN** (Edward), founder of Dulwich college, in Surrey, was born in 1500. He acquired great reputation as an author, and became master of a large company, proprietor of a play-house in Moorfields, and keeper of the royal hunt-garden, which was worth 500*l*. a year. Aubrey says that the devil appeared to him while he was personating the character of



## ALL

**Alatus**, which so frightened him, that he grew serious, and left off that profession. He laid the foundation of his college in 1614, and completed it in 1617, at the expence of 10,000l. He then endowed it with 800l. per annum, for the maintenance of one master and one warden (who must be unmarried, and always of the name of Alleyen, or Allen), and four fellows, of whom three are to be clergymen, and the fourth an organist, besides six poor men and six women, with twelve poor boys, who are to be educated till the age of fourteen or sixteen, when they are to be apprenticed out to some trade. This building is called "The college of God's gift." He was himself the first master. He died in 1626, and was buried in the chapel of the college.

**ALL-FOURS** *s* (from *all* and *four*) A low game at cards, played by two.

**ALL-GOOD** English mercury. The vulgar name for the *chenopodium bonus Henricus* of Linnaeus; a plant which may be boiled for spmash, and which is in no degree inferior to it.

**ALL-HEAL** *s* (from *all* and *heal*, for health.) All health (*Walsch*).

**ALL-HALLOW** **ALL-HALLOWS** *s* (from *all*, and *hallow*) All saints-day.

**ALL-HALLOWN** *a* (from *all* and *hallow*) The time about All saints-day (*Shaks*).

**ALL-HALLOWS**, a small island noted for its fishery, at the N W corner of Pomoná, one of the Orankeys.

**ALL-HALLOWTID** *s* (See **ALL-HALLOWN**) The term near All-saint (*Bacon*).

**ALL-HEAL**, clown's. See **STRACHYS**.

**ALL-HEAL**, Heracles. See **HERACLIUM** and **PASTINACA**.

**ALLIA**, a small river of Italy, in the territory of the Sabines, to which Virgil annexes the epithet of "infortunium nomen" in allusion to the defeat of the Roman army by the Gauls on the banks of this river, in the year of Rome 363, when 40,000 Romans were either killed or put to flight.

**ALLIANCE**, in the civil and canon law, the relation between two persons, or two families, contracted by marriage.

**ALLIANCE**, is also used to signify a treaty entered into by sovereign princes or states, for their mutual safety or defence.

**Defensive Alliance**, is that whereby the contracting parties engage to stand by and assist each other against any power that shall attack either.

**Offensive Alliance**, implies an agreement between powers, whereby they engage themselves to attack jointly some other prince or state.

**ALLIARIA** (*Alliaria*, *a*, *f*, from *allium*, and *aria*, a small) resembling garlic) One of the herbs. Hence alone, or stinking alone, is the plant to which this name is given in the pharmacopoeia. The crysmum plant, *Rubus cordatus*, of Linnaeus, is sometimes exhibited in hospital anthems and evensongs with success. Its virtues are powerfully diaphoretic, diuretic, and antiscorbutic.

## ALL

**ALLICA**, in entomology, a species of *pepilio nymphalis*.

**ALLICIENCY** *s* (*allicio*, Latin) The power of attracting any thing (*Glanville*).

**ALLIER**, a department of France, it is so called from a river which flows by Moulins, and falls into the Loire above Orleans.

**To ALLIGATE** *v a* (*alligo*, Lat) To tie one thing to another, to unite.

**ALLIGATI**, the basest kind of Roman slaves, who were usually kept fettered.

**ALLIGATION**, a rule in arithmetic, by which are resolved questions which relate to the compounding or mixing together of divers simples or ingredients, being so called from *alligare*, to tie or connect together, probably from certain vincula, or crooked ligatures, commonly used to connect or bind the numbers together.

Alligation is of two kinds, medial and alternate.

**Alligation medial** is the method of finding the rate or quality of the composition, from having given the rates and quantities of the simples or ingredients.

Rule multiply each quantity by its rate, and add all the products together; then divide the sum of the products by the sum of the quantities, or whole compound, and the quotient will be the rate sought.

*For example*, Suppose it were required to mix together six gallons of wine, worth 12 a gallon, 8 gallons, worth 6 the gallon, and 4 gallons, worth 8 the gallon, and to find the worth or value, per gallon, of the whole mixture.

Gal	Products
6 mult by 12	giv 72
8       "   6	48
4       "   8	32

whole comp 18                      110 sum of prod.  
Then 18) 110 (6 $\frac{1}{3}$  or 6 $\frac{1}{3}$  is the rate sought  
108

**Alligation Alternate** is the method of finding the quantities of ingredients or simples, necessary to form a compound of a given rate.

Rule 1st Place the given rates of the simples in a column, under each other, noting which rates are less, and which are greater than the proposed compound. 2d Connect or link with a crooked line, each rate which is less than the proposed compound rate, with one or any number of those which are greater than the same, and every greater rate with one or any number of the less ones. 3d Take the difference between the given compound rate and that of each simple rate, and set this difference opposite every rate with which that one is linked. 4th Then if only one difference stand opposite any rate, it will be the quantity belonging to that rate; but when there are several differences to any one, take their sum for its quantity.

*For example*, Suppose it were required to mix together gold of various degrees of fineness, viz of 19, of 21, and of 23 carats fine,

## A L L

so that the mixture shall be of 20 caracts fine. Hence,

	Rates	Diff.	Sum of Diff.
Comp	21	1	1 of 21 caracts fine,
rate	10	1+3	4 of 10 caracts fine,
20	23	1	1 of 23 caracts fine

That is, there must be an equal quantity of 21 and 23 caracts fine, and 4 times as much of 19 caracts fine

Various limitations, both of the compound and the ingredients, may be conceived, and in such cases, the differences are to be altered proportionally

Questions of this sort are however commonly best and easiest resolved by common algebra, of which they form a species of indeterminate problems, as they admit of many, or an indefinite number of answers

**ALLIGATOR** A species of the genus *Lacerta*. Its specific character is, head flat, imbricate, nape naked, tail above with two rough lateral lines. It inhabits the central parts of America is less than the crocodile, but resembles it in habits and voracity. See *LACERTA*

**ALLIGATOR PEAR**, in botany. See *LAURUS*

**ALLIGATURE** *s* (from *alligate*) The ligature by which two things are joined together

**ALLIONIA** In botany, a genus of the class and order tetrandria monogynia. Common calyx oblong, simple, three-flowered, proper, obsolete, superior, corollets irregular receptacle naked. The only known species is a native of South America

**ALLIOTH** or **ALTOIH**, an Arabian word, literally denoting a horse. It was originally applied to each of the three chief stars in the tail of *Ursa Major*, but is now confined to the first of these, marked  $\gamma$  by Bayer

**ALLISION** *s* (*alludo allisum*, Lat.) The act of striking one thing against another (*Woodward*)

**ALLITERATION**, an ornament of which language appears to be capable. It is chiefly used in poetry, and consists in the repetition of the same letter at certain intervals. It sometimes deforms language, however, instead of adorning it, especially in prose compositions, and on this account, as well as the trivial degree of excellence which attaches to it even when judiciously applied, critics in general disregard it. The poets furnish numerous instances of alliteration, most of them perhaps accidental. Dr Johnson cites the following line from *Milton*, as an instance

"Behemoth biggest born—"

But Gray's Odes abound with alliterations, almost every strophe commencing and concluding with an alliterative line

"Run seize thee, ruthless king"

"To high-born Hoel sharp, or soft Llewellyn's lay"

"Weave the warp, and weave the woof"

"Stamp we our vengeance deep, and ratify his doom."

## A L L

"Regardless of the sweeping whirlwind's sway,

That hush'd in grim repose, expects his evening prey"

From Mr Pope we may also draw an example

"Eternal beauties grace the shining scene,  
Fields ever fresh, and groves for ever green"

And one from Shakspeare

"Had my sweet Harry had but half their numbers,

This day might I, hanging on Hotspur's neck,

Have talked" Hen IV part ii act 3.

**ALL JUDGING**, *a* (from *all* and *judge*) That has the sovereign right of judgment (*Rowe*)

**ALLIUM** Garlic A genus of the class and order hexandria monogynia, thus characterised. Corol six-petalled, spreading, spathe bifid, many-flowered, umbel crowded; stigma simple. Fifty species of this plant have been traced through the different parts of Europe, and four or five other species in the West Indies and America. Those most common to ourselves are, 1 *A sativum* Common garlic. 2 *A scorodoprasum* Rocambole 3 *A esculonicum* Schallot Eschalotte 4 *A ursinum* Ramsons 5 *A aspa* Onion. 6 *A fistulosum* Welsh onion (L'abouie 7. *A schenoprasum* Cives or chives. The medicinal uses of garlic are various. It is given as an expectorant in pituitous asthma. Its utility, as a diuretic, in dropsies, is very considerable. It is also esteemed as an antihelminthic, and the decoction of the root is of infinite service in calculous and gravelly complaints. The syrup and oxymel of garlic are expunged from our pharmacopoeias, as the swallowing of the root in small pieces is considered the best way of administering it

**ALL-KNOWING**, *a* (from *all* and *know*) Omniscient, all wise (*Atterbury*)

**ALLOA**, a commercial town on the Frith of Forth, in Clackmannanshire. It consists of one spacious street well paved. It has a glasshouse, and other manufactures, and has 5214 inhabitants. Lat 56 10 N Lon 3 45 W

**ALLOBROGES**, in ancient geography, the inhabitants of that part of Gallia Narbonensis, which was separated between the rivers Isara to the south and Rhodanus to the north, and the Lacus Lemanus, comprehending a great part of the countries since known by the names of Savoy, Dauphine, and Piedmont. Their metropolis was Vienna. Cicero (*Catull. m.*) commends the Allobroges for their bravery, but Horace (*Epod. xvi*) reproaches them on account of their fondness for novelty

"Novisque rebus infidelis."

**ALLOCATION**, *s* (*allocare*, Lat.) The act of putting one thing to another. The admission of an article into account, as an allocation of it to the account

**ALLOCUTION** *s* (*allocutio*, Lat.) The act of speaking to another.



**A L L**

arts, as brass, which is composed of copper and zinc, bell-metal, or bronze, composed of

# ALL

copper and tin, pewter, of tin, lead, and antimony, soft solder, of bismuth and tin, specula, for reflecting telescopes, of copper, tin, and arsenic, Pinchbeck, prince's metal, &c. which see under their respective names. The alloys, in general, will be treated of at the same time with the different metals of which they are composed, or with which they are found native. Combinations of the metals, with mercury are called amalgams, for an account of which, see AMALGAM.

**ALL-POWERFUL** *a* (from *all* and *powerful*) Almighty, omnipotent (*Swift*)

**ALL SAINTS-DAY** *s* The day on which there is a general celebration of the saints, the first of November. See **ALI-SAINTS**

**ALL-SEED** See **LINUM**

**ALL-SFLING** *a* (from *all* and *see*) That beholds every thing (*Dryden*)

**ALL SPICE** See **MYRTUS** and **PRIMINTO**

**ALL SUFFICIENT** *a* (from *all* and *sufficient*) Sufficient to every thing (*Norris*)

**To ALLUDE** *v n* (*alludo*, Lat) To have some reference to a thing, without the direct mention of it, to hint at (*Burnet*)

**ALIUM** See **ALUM**

**ALLUMINOR** *s* (*allumer*, Fr) to light) One who colours or paints upon paper or parchment (*Comell*)

**To ALLURE** *v a* (*lurer*, Fr) To entice to any thing (*Milton*)

**ALLURE** *s* (from the verb) Something set up to entice other things to it (*Hayward*)

**ALLUREMENT** *s* (from *allure*) Enticement, temptation of pleasure (*Dryden*)

**ALLURER** *s* (from *allure*) Enticer, enveigler

**ALLURINGLY** *ad* (from *allure*) In an alluring manner, enticingly

**ALLURINGNESS** *s* (from *alluring*) Enticement, temptation by proposing pleasure

**ALLUSION** *s* (*allusio*, Lat) A hint, an implication (*Burnet*)

**ALLUSION**, **ALLUSIO**, in rhetoric, a figure whereby something is applied to, or understood of another, by reason of some similitude of name, or sound. The word is formed of *ad*, and *ludere*, to play

**ALI'USIVE** *a* (*alludo*, *allusum*, Latin) Hinting at something (*Rogers*)

**ALLUSIVELY** *ad* (from *allusive*) In an allusive manner, by implication (*Hammond*)

**ALLUSIVENESS** *s* (from *allusive*) The quality of being allusive

**ALLUVIAL LIMESTONE**, a sort of stone found in many districts, supposed to have been formed in the earliest ages of the world by the deposition of calcareous matters held in the state of solution in water

**ALLUVION** *s* (*alluvio*, Lat) 1 The carrying of any thing to something else by the motion of water 2 The thing carried by water to something else (*Cowell*) 3 The gradual increase of land along the sea shores, or on the banks of rivers. The civil law places

# ALM

alluvion among the lawful means of acquisition; and defines it to be a latent, imperceptible accretion—Hence, when any considerable portion of ground is torn away at once, by an inundation, and joined to some neighbouring estate, this is not acquired by right of alluvion, but may be claimed again by the former owner.

**ALL-WISE** *a* (from *all* and *wise*) Possessive of infinite wisdom (*Prior*)

**To ALLY** *v a* (*allier*, Fr) 1 To unite by kindred, friendship, or confederacy (*Pope*), 2 To make a relation between two things, by similitude, or any other means (*Dryden*)

**ALIVY** *s* (*allie*, Fr) One united by some means of connexion (*Temple*)

**ALMAA** (, or **ALMACH**, a star of the second magnitude, marked  $\gamma$  in Andromeda's left foot

**ALMADIE**, a kind of African canoe, or small vessel, about four fathoms long, commonly made of bark

**ALMADIE**, is also the name of a kind of long-boats, fitted out at Calicut, which are eighty feet in length, and six or seven in breadth

**ALMAGEST**, the name of a celebrated book, composed by Ptolemy, being a collection of many of the observations and problems of the ancients, relating both to geometry and astronomy. In the original Greek it was called *συνταξις μαγιστη*, q d greatest construction, or collection, which last word *magiste*, joined to the particle *al*, gave occasion to its being called *almagest* by the Arabians, who translated it into their tongue about the year 800, by order of the caliph Al Ma'mun.—The Arabic word is *almagesti*. Ptolemy was born about the year of Christ 69, and died in 147, and wrote this work, consisting of 13 books, at Alexandria in Egypt, where the Arabians found it on the capture of that kingdom. It was by them translated out of Greek, into Arabic, by order of the caliph Al Ma'mun, about the year 927, and first into Italian about 1230, by favour of the emperor Frederick II. The Greek text however was not known in Europe till about the beginning of the 15th century, when it was brought from Constantinople, then taken by the Turks, by George, a monk of Trabesond, who translated it into Latin, which translation has several times been published. Riccioli, an Italian jesuit, also published, in 1651, a body of astronomy, which, in imitation of Ptolemy, he called *Almagestum Novum*, the New *Almagest*, being a large collection of ancient and modern observations and discoveries, in the science of astronomy.

**ALMAGRA**, a fine deep red ochre, with some admixture of purple, very heavy, and of a dense yet friable structure, and rough dusty surface. It adheres very firmly to the tongue, melts freely and easily in the mouth, and stains the skin on touching. It is the *Sil. Almagrum* of the ancients. It ferments very violently with acids, which sufficiently distinguishes it from the *Sil. Syriacum*, to which it has in many

respects a great affinity. There are immense quantities of it in many parts of Spain. It is used in painting, and in medicine as an astru-  
gent.

**ALMAMON**, or **ABDALLAH**, caliph of Bagdad, was the son of Haroun al Raschid, and born about 785. On the death of his brother, Al Amru, in 813, he obtained the sovereignty, which he adorned by his virtues and good conduct. He was fond of learning, and encouraged learned men. He founded an academy at Bagdad, and invited thither able professors to teach the languages and sciences. He calculated himself a set of astronomical tables, and caused the works of the most celebrated ancient authors to be translated into Arabic. He died in 833.

**ALMANACK**, a book or table, containing a calendar of days and months, the rising and setting of the sun, the age of the moon, the eclipses of both luminaries, &c. Authors are divided with regard to the etymology of the word, some deriving it from the Arabic *al manach*, and *manach*, to count, some from *alm* and *man*, new year's gifts, because the Arabian astrologers used at the beginning of the year to make presents of their ephemerides, and others, from the Teutonic *almanachte*, observations on all the months. Some derive it from the Arabic particle *al*, and the Greek *man* month, or *manach*, the course of the months. But the most simple etymology appears from the common spelling, the word being composed of two Arabic ones, *Al Manack*, which signify the *Diary*. Regiomontanus appears to have been the first in Europe who reduced almanacks into their present form and method, gave the characters of each year and month, foretold the eclipses and other phases, calculated the motions of the planets, &c. His almanack was first published in 1474.

Almost ever since almanacks have been known, astrological and other predictions have been considered, if not as an essential part, at least, as a very useful auxiliary. This continues to be the case to the present day, with some almanacks, notwithstanding that most people pretend to disbelieve such predictions. It is a curious fact that in the year 1800, about 400,000 copies were sold of Moore's Almanack, while other much more useful and instructive almanacks, as the *Lady's* and *Gentlemen's Diaries*, were confined in their circulation to a few thousands.

The almanack, annexed to the book of Common Prayer, is part of the law of England, of which the courts must take notice in the returns of writs, &c. For ascertaining many circumstances relative to a particular day past, the court hath determined by an inspection of the almanack. Upon a writ of error from an inferior court, the error assigned was, that the defendant was married on a Sunday, the day being the 24th of the month of May, 1785, if appearing, by the almanack, to be a Sunday. The court, upon a writ of error, found that the defendant was married on a Sunday, the day being the 24th of the month of May, 1785, if appearing, by the almanack, to be a Sunday.

and, that a trial by jury was not necessary, although it was an error in fact, and so the judgment was reversed. But in all these cases, the judges, if they conceive a doubt, may order it to be tried by a jury. Blacket Com vol iii p 333.

**Nautical Almanack**, and **Astronomical Ephemeris**, a kind of national almanack, published by anticipation for several years before hand, for the convenience of ships going out upon long voyages. It is adapted to the first meridian, and contains, besides many particulars common to other almanacks, the sun's longitude, right ascension, declination, the planets' longitudes, latitudes, times of passing the meridian, the times of solar and lunar eclipses, together with those of Jupiter's satellites, the distances of the moon from the sun, and certain fixed stars, and, in general, the times when any remarkable celestial appearances may be seen at the place for which the ephemeris is calculated. This ephemeris was proposed by Dr Maskelyne to be calculated for the meridian of Greenwich, and the scheme being adopted by the commissioners of longitude, the first Nautical Almanack was published in 1767, and they have been regularly published ever since, and are continued as far as the year 1812. Dr Maskelyne has also published *Requisite Tables* to be used with the Nautical Ephemeris, which, together with the Ephemeris, are indispensably necessary in most of the methods of finding the longitude now used, and will, even if the doctor had done nothing else for the promotion of astronomy and navigation, ever reflect upon him the highest honour, and most lasting celebrity.

It must be confessed, however, that with the exception of the Nautical Almanack, White's Ephemeris, and two or three others, the almanacks published in this country are very inferior in point of utility to what might naturally be expected, considering the state of human knowledge amongst us. Instead, for example, of publishing county almanacks upon a single sheet, it would be far more useful to make them occupy a volume. Three or four contiguous counties might constitute a department. And then, besides the most interesting astronomical particulars peculiar to an almanack, the following subjects might be treated of. 1. There might be a succinct geographical description of the earth, and of its principal divisions, enlarging most upon Great Britain, and the department for which the almanack was intended. 2. A brief view of the constitution and government of England in church and state, with the names of the principal officers in both. 3. A sketch of the state of agriculture, manufactures, and commerce in England, and a more minute account of their state and annual progress, in the particular department. 4. The state of the annual, vegetable, and mineral productions, in the department. 5. A table of its population, the births, marriages, and deaths, usual term of human life; instances of peculiar lon-

evity, number of men capable of bearing arms, &c. 6 Examples of humanity, courage, public spirit, &c. in the department 7 State of religion, and of public instruction 8 Tables of meteorological observations, during the preceding year These, and other subjects, which do not immediately occur to our minds, would furnish scope for an interesting variety, yearly, and the comparison of the almanacks of the different departments, would have a strong tendency to diffuse more widely the benefits resulting from agricultural, commercial, literary, and moral improvement

ALMANACK, among antiquaries a kind of instrument usually of wood, inlaid with various figures and Runic characters, and representing the order of the feasts, days of the week, and other matters necessary to be known throughout the year almanacs of this kind were used by the ancient northern nation, and are known by various names, as runestocks, primisticks, &c. bils, bæccul ann des, &c.

ALMARI, in ancient records, the archives of a church, or the like.

ALME, or ALMA, singing and dancing girls in Egypt, who, like the Italian improvisatori, can occasionally pour forth "unpremeditated verse" They are called Alme, from having received a better education than other women They form a celebrated society in that country To be received into it, according to Mr Savary, it is necessary to have a good voice, to understand the language well, to know the rules of poetry, and be able to compose and sing couplets on the spot, adapted to the circumstances of the occasion The common people have also their Alme They are girls of the second class, who try to imitate the former, but they have neither their elegance, their graces, nor their knowledge

ALMEIDA, a frontier town of Beira, in Portugal, containing about 2200 inhabitants Lat 40 38 N Long 8 15 W

ALMEIDA, a frontier town of Portugal, on the confines of Leon The Spaniards besieged and took it in 1762 Lat 40 45 N Long 6 15 W

ALMFISAR, a celebrated game among the ancient Arabs, performed by a kind of casting of lots, with arrows, strictly forbid by the law of Mahomet, on account of the frequent quarrels occasioned by it

The manner of the game was thus a young camel being brought and killed, was divided into a number of parts The adventurers, to the number of seven, being met, eleven arrows were provided without heads or feathers, seven of which were marked, the first with one notch, the second with two, the third with three, &c the other four had no marks These arrows were put promiscuously into a bag, and then drawn by an indifferent person Those to whom the marked arrows fell, won shares in proportion to their lot, the rest to whom the blank arrows fell, were entitled to no part of the stakes but obliged to pay the whole price of it When the winners tasted not of the feast

themselves, more than the losers; but the whole was distributed to the poor

ALMENE, in commerce, a weight of two pounds, used to weigh saffron in several parts of the continent of the East Indies

ALMERICANS, were the followers of Almeric, or Amauri, in the thirteenth century They maintained that the power of the Father continued no longer than the Mosiac dispensation; that the empire of the Son extended only to the thirteenth century; and that then the reign of the Holy Ghost commenced, when all sacraments and external worship were to be abolished, and the salvation of Christians was to be accomplished merely by internal acts of illuminating grace Their morals were as infamous as their doctrine was absurd

ALMIGGIM WOOD (Scripture), is thought to be that of the Indian pine-tree; which being light and white, was greatly esteemed for making musical instruments

ALMIGHTINESS (from almighty) Unlimited power, omnipotence, one of the attributes of God (Taylor)

ALMIGHTY a (from all and mighty) Of unlimited power, omnipotent (Genetis)

ALMO, in ancient geography, a river of Lattum, which, rising near Bovillæ, took a northern direction, and discharged itself into the Tiber to the south west of Rome

ALMOGIZA, the circumference of the ascotric

AI MOHARRAM, the first month of the Arab year

ALMOND, bitter, common, and sweet. See AMYGDALA

ALMOND, African, and Ethiopian. See BRABEJUM

ALMOND, or ALMAN-FURNACE, is a peculiar kind of furnace, used in refining, to separate all kinds of metals from cinders, parts of melting-pots, tests, bricks, &c It is the common melting furnace of the German refiners See FURNACE

ALMOND-STONES See AMYGDALITES

ALMONDBURY, a village in the West Riding of Yorkshire, formerly a Roman town called Campodonum

ALMONDS OF THE EARS The tonsils so called in common language from their situation and resemblance See TONSILS

ALMONDS OF THE THROAT The same as ALMONDS OF THE EARS See TONSILS

ALMONER in its primitive sense, denotes an officer in religious houses, to whom belonged the management and distribution of the alms of the house By the ancient canons, all monasteries were to spend at least a tenth part of their income in alms to the poor The almoner of St Paul's is to dispose of the money left for charity, according to the appointment of the donors, to bury the poor who die in the neighbourhood, and to breed up eight boys to singing, for the use of the choir By an ancient canon, all bishops are required to keep almoners

Lord ALMENER, or Lord High Al-

## ALN

**MONER**, OF ENGLAND, is an ecclesiastical officer, generally a bishop, who has the forfeiture of all deadlands, and the goods of *kelos* de se, which he is to distribute among the poor. He has also, by virtue of an ancient custom, the power of giving the first dish from the king's table to whatever poor person he pleases, or, instead of it, an alms in money.

**ALMONRY**, or **AUMBRY**, the office or lodgings of the almoner, also the place where alms were distributed.

**ALMOST** *ad* (from *all* and *most*) Nearly, well nigh (*Bentley*)

**ALMS**, *elemosyna*, a general term for what is given out of charity to the poor. Anciently, the ecclesiastics subsisted wholly on alms, which were thus divided: one part was allotted to the bishop, another to the priests, and a third to the deacons and subdeacons, which made their whole subsistence, the fourth part was employed in relieving the poor, and in repairing the churches.

**ALMSBASKET** *s* (from *alms* and *basket*) The basket in which provisions are put to be given away (*L'Estrange*)

**ALMSDEED** *s* (from *alms* and *deed*) An act of charity, a charitable gift (*Shaks*)

**ALMSGIVER** *s* (from *alms* and *giver*) He that supports others by his charity (*Bacon*)

**ALMSHOUSE** *s* (from *alms* and *house*) A hospital for the poor (*Pope*)

**ALMSMAN** *s* (from *alms* and *man*) A man who lives upon alms (*Shakespeare*)

**ALMUCANTARS**, in astronomy, circles parallel to the horizon, imagined to pass through all the degrees of the meridian. The word is Arabic. The modern astronomers more commonly use the term parallels of altitude.

**ALMUCANTAR'S-STAFF**, an instrument having an arch of 15°, used to take observations of the sun about the time of its rising and setting, in order to find the amplitude.

**ALMUCIUM**, a cover for the head, worn formerly by monks: it was somewhat like the square caps now worn in universities.

**ALMUGEA**, in astrology, a certain configuration of the five planets, in respect of the sun and moon, correspondent to that which is between the hours of those planets, and the sun's and moon's hours.

**ALMUGIM**, or **ALMUG-TREE**, a certain kind of wood mentioned in the first book of Kings, ch. x. ver. 11. and 2d Chron. ch. ii. ver. 8. It was imported by Solomon from Ophir, and used in the making of rails, or pillars of the temple. It is thought to be the same with the *mutim*-wood, of which such frequent mention is made by Moses.

**ALMUREDDIN**, the Arabic name of the star *Antares*, in *Virgo*.

**ALMUTENIA**, or **ALMUTENIA**, in astrology, a sign which supersedes the rest in the zodiac.

**ALMUTENIA**, a measure by the ell, a measure formerly was to measure the length of the body.

**ALMUTENIA**, a measure by the ell.

## ALO

measure, or rather the measuring by the ell or yard.

**ALNEWICK**, or **ALNWICK**, the county town of Northumberland, with a market on Saturday. It is a populous and well-built town, with three gates, seated on the river Alne, thirty miles N of Newcastle. Lat 55 25 N Long 1 30 W.

**ALNIFOLIA** See **CLETHRA**.

**ALNI-FRUCTU** See **CONOCARPUS**, and **THEOBROMA**.

**AL'NIGHT** *s* A great cake of wax, with the wick in the midst (*Bacon*)

**ALNUS** (*aln*, *alun*, Heb.) The birch, or alder-tree. The juice of the fresh leaves of this plant, *betula*, *alnus pediculus ramosis* of Linnæus, are employed to discuss the indurated lacteal glands of inflamed breasts in wet nurses. See **BETULA**.

**ALOA**, in Grecian antiquity, a festival kept by husbandmen in honour of Ceres. It greatly resembled our harvest-home.

**ALOE** In botany, a genus of the class and order hexandria monogynia. Corol *gastr*, inferior, with an expanded mouth and nectariferous base, calyxless, filaments inserted into the receptacle. Its species are seventeen, found in different parts of the southern climates of Europe, in Asia, Africa, and America, but chiefly at the Cape, which only differ in their respective degrees of purity, the first being the best. The following is the manner of obtaining them: deep incisions are made in the plant, which gradually distil a juice, which being poured off from its seculence, is inspissated in the heat of the sun, and in that state put into leathern bags under the name of socotrine aloes. The juice obtained from the leaves by a slight pressure, after being in like manner purified and inspissated, is that denominated hepatic aloes, or from its more common origin, *aloe barbadensis*. The same leaves by a stronger pressure afford other juice, which mixed with the dregs of the two foregoing, constitutes the cabaline aloes. The first kind contains more gum but less resin than the two last, and on this account is a milder and less drastic purge. The aloes constitutes an ingredient in various preparations in most modern pharmacopœias, under the various forms of wines, tinctures, pills, and powders.

**ALOE, AMERICAN** See **AGAVE**.

**ALOE, WATER**. See **STRATIGOTES**.

**ALOE LIGNUM** See **LIGNUM ALGES**.

**ALOEITICAL** *a*. (from *aloes*.) Consisting chiefly of aloes (*Wiseman*)

\* Of these, the only two worth noticing are a. *dichotoma* with forked stem, ensiform leaves, and pointed flowers, frequently employed as an excellent hedge-fence; and a. *perfoliata*, caulescent, with ensiform toothed, erect leaves, and racemed, reflected, cylindrical flowers, indigenous to India, Africa, and Italy. From this plant we obtain the three kinds of medical aloes, sold under the names of *socotrina*, or aloes of Socotra, where it is chiefly manufactured; *hepatic*, or liver-coloured; and *cabaline*, or horse-aloes.

\* **ALOFF** *ad* (*lofter*, to lift up, Dan.) On high, above, in the air (*Suckling*)

**ALOFF** *prep* Above (*Milton*)

**ALOGIANS**, in church-history, a sect of ancient heretics, who appeared about the close of the second century. They denied that Jesus Christ was the Logos, and consequently rejected the gospel of St John. The word is compounded of the privative *a*, and *λογος*, *q* *d* without Logos or Word.

**ALOGOTROPHIA** (*αλογотροφία*, from *αλογος*, *unequal*, and *τροφω*, to nourish) Partial or disproportionate nourishment, as in the rickets.

**ALOGY** *s* (*ἀλογία*) Unreasonableness, absurdity.

**ALOIDES** (*αλοιδης*, from *αλος*, the aloe, and *ιδης*, a likeness) The water-aloe.

**ALONE**. *s*. (*alleen*, Dutch.) 1 Without another; single (*Bentley*). 2 Without company; solitary (*Johnson*).

**ALONG** *ad* (*à l'envers*, Fr.) 1 At length (*Dryden*). 2 Through any space measured lengthwise (*Bacon*). 3 From allans, Fr) Forward; onward (*Pope*).

**ALONGE** *ad* Through the length (*Kneller*).

**ALOFF** *ad* (*all off*, that is, quite off) At a distance, at a small distance (*Dryden*).

**ALOPECES** (*αλοπεκες*, from *αλωπεξ*, a fox.) The *PROX* muscles (which see), so named by Fallopius and Vesalius, because in a fox they are peculiarly strong.

**ALOPECIA** (*αλωπεκία*, from *αλωπεξ*, the fox.) Baldness, a morbid loss of hair. A disease enumerated in the nosology of Sauvages.

**ALOPECUROS** See *HERONIA*.

**ALOPECURUS** Fox-tail grass. A genus of the class and order triandria digynia. Calyx two-valved, one-flowered, corol one-valved. It embraces six species, four of which are inhabitants of the marshes, and oozy meadows of our own country. The other two are natives of India.

**ALOS** (*αλος*, from *αλω*) Salt.

**ALOSA** (*αλωση*, from *αλωω*, to seize, as being a predatory fish.) The haddock. Its flesh was formerly much esteemed by medical practitioners as a restorative.

**ALOU** *ad* (*from a and loud*) Loudly, with a great noise (*Wallis*).

**ALOW** *ad* (*from a and low*) In a low place, not aloft (*Dryden*).

**ALPAGH** is sometimes used to denote the pith here of feeding cattle on the Alps.

**ALPAM**, in botany. See *ALPAMA*.

**ALPHA**, either in the vicinity of Antioch, near which Constantine was killed, and to which his body was taken.

**ALPHA**, the alpha is the first letter of the Greek alphabet, answering to our *A*. As a figure, it stands for one, or the first of any thing. It is particularly used among ancient writers to denote the chief man of a clan or family.

**ALPHABET**, the natural or customary series of the several letters of a language. The word is formed from alpha and beta, the first

and second letters of the Greek alphabet. The number of letters is different in the alphabets of different languages. The English alphabet contains 24 letters, to which if we add *j* and *v* consonant, the sum will be 26. The French contains 23, the Hebrew, Chaldee, Syriac, and Samaritan, 22 each, the Arabic 28, the Persian 31, the Turkish 33, the Georgian 36, the Coptic 32, the Muscovite 43, the Greek 24, the Latin 22; the Sclavonic 27, the Dutch 26, the Spani 27; the Italian 20; the Shanscrit 50, the Ethiopic and Tartarian, each 202, the Indians of Bengal 21, the Barmese 19. The Chinese have, properly speaking, no alphabet, except we call their whole language by that name, their letters are words, or rather hieroglyphics, amounting to about 80,000.

It has been a matter of considerable dispute whether the method of expressing our ideas by visible symbols called letters, be really a human invention, or whether we ought to attribute an art so exceedingly useful, to an immediate revelation from the Deity. It would lead us, however, into too wide a field to discuss this subject, and to state the arguments that have been used on both sides; neither is it immediately necessary to our purpose, although we are most inclined to the latter opinion.

By the learned author of *Harper*, we are taught that it is to about 20 plain elementary sounds we owe that variety of articulate voices which have been sufficient to explain the sentiments of such an innumerable multitude, to all the past and present generations of men. Mr. Sheridan says, that the number of simple sounds in our tongue is 25; while Dr. Keble says, that we have only 11 distinct series of articulate sounds, which even by contraction, protraction, and composition, are increased only to the number of 15; every syllable or articulate sound in our language being one of these number. Bishop Walton speaks of 23 distinct sounds.

After the decomposition of language into its elementary sounds, the next step towards the notion of it by alphabetical characters, would be the delineation of a separate mark or letter to represent each sound. These marks, though few in number, would admit of such a variety of arrangements, as might be capable of expressing an infinity of articulate sounds. The ingenious Mr. Wallis is to show, that ten characters are sufficient for this purpose; and if this be the case, then the most simple alphabet, consisting of 10 letters, must have been sufficient to answer the purpose of mankind, and much of our two thousand letter alphabet may appear superfluous. The number of combinations of these simple sounds, or letters, is so great, that it is not possible to express all the sounds that are articulated by man. As there



# A L P

are more sounds in some languages than in others, it follows of course, that the number of elementary characters, or letters, must vary in the alphabets of different languages. The numbers of several are stated at the beginning of this article. We cannot here enter the discussion of the powers, shapes, deficiencies, &c. of the various alphabets, but must content ourselves with laying down the scheme of the English alphabet, as given by Mr. Sheridan in his *Rhetorical Grammar*.

The number of simple sounds in our tongue is 28

9 Vowels,  
3 1 2 3 2 3 1 1 1  
a a a e o o e i u  
hall hat hate beer note noose bet fit but

w y  
short oo short ee

19 Consonants,  
eb ed ef eg ek el em en ep er es et  
ev ez eth eth esh ezh ing.

2 Superfluous,  
c, which has the power of ck or ess;  
q, that of ck before u

2 Compound,  
j, which stands for gash,  
x, for ks, or gs.

1 No letter,  
4, merely a mark of aspiration  
Consonants divided into Mutes and Semivowels.

8 Mutes,  
eb ed ef eg ek el em en ep er es et

3 Pure Mutes,  
eb ed ef

3 Impure,  
eb ed ef

13 Semivowels, or liquids,  
el em en er es ez eth eth esh ezh

ing.

9 Focal,  
el em en er es ez eth esh ing.

4 Aspirated,  
ef es eth esh

Divided again into

4 Labial,  
eb ep ev ef

3 Dental,  
ed et eth eth ez esh esh

4 Palatine,  
eg ek el er.

3 Nasal,  
em en ing.

The writer observes, that our alphabet is ill-suited for the notation of the English language, as there are many sounds for which we have no letters or marks; and there ought to be some more characters or letters to make a complete alphabet, in which every simple sound should have a mark peculiar to itself. He also observes, that the Roman alphabet is ill-suited for the notation of the English language, as there are many sounds for which we have no letters or marks; and there ought to be some more characters or letters to make a complete alphabet, in which every simple sound should have a mark peculiar to itself.

A kind of alphabet, which is a kind of natural order, each letter representing a sound or letter, in which are written the names

# A L P

of those who have open accounts, referring to the folios of the ledger where they are to be found

ALPHABETICAL a (from *alphabet*) According to the series of letters (*Suif*)

ALPHABETICALLY ad In an alphabetical manner (*Holder*)

ALPHERATFER, a fixed star of the third magnitude in Aquarius

ALPHEUS, in ancient geography, one of the names of Pisa, in Etruria

ALPHIUS, a river of Elis, whose source was in the interior part of Peloponnesus, in the south-east coast of Arcadia. The Olympic games were celebrated on the banks of this river, and Orpheus was worshipped as a god at Olympia. Thus Pindar

"Alpheus, thy immortal flood,  
On his lord's triumphant brows  
Th' Olympic wreath bestow'd."

Ode i. West's Pindar, vol. 1, p. 7  
ALPHONSIN, in surgery, an instrument for extracting bullets out of gun-shot wounds

This instrument derives its name from the inventor, Alphonsus Ferrier, a physician of Naples. It consists of three branches, which are closed by a ring. When closed and introduced into the wound, the operator draws back the ring towards the handle, upon which the branches opening take hold of the ball, and then the ring is pushed from the haft, by which means the branches grasp the ball so firmly as to extract the ball from the wound. See WOUNDS, and SURGERY.

ALPHONSO, in biography, the name of several kings of Portugal

ALPHONSUS X, king of Leon and Castile, who has been surnamed the Wise, on account of his attachment to literature, and is now more celebrated for having been an astronomer than a king. He was born in 1203, succeeded his father Ferdinand III in 1252, and died in 1284, at the age of 81

This prince understood astronomy, philosophy, and history, as if he had been only a man of letters, and composed books upon the motions of the heavens, and on the history of Spain, which are highly commended. "What can be more surprising," says Mariana, "than that a prince, educated in a camp, and handling arms from his childhood, should have such a knowledge of the stars, of philosophy, and the transactions of the world, as men of leisure can scarcely acquire in their retirements? There are extant some books of Alphonsus on the motions of the stars, and the history of Spain, written with great skill and incredible care." In his astronomical pursuits he discovered that the tables of Ptolemy were full of errors; and therefore conceived, first of any, the resolution of correcting them. For this purpose, about the year 1260, and during the life of his father, he assembled at Toledo the most skillful astronomers of his time, Christians, Moors, or Jews, when a plan was formed for constructing new tables. This task was accomplished about 1292, the first year of his reign; the tables being drawn up chiefly by the skill and pains

of rabbi Isaac Hazan, a learned Jew, and the work called the Alphonsine Tables, in honour of the prince, who was at vast expences concerning them. He fixed the epoch of the tables to the 30th of May 1202, being the day of his accession to the throne. They were printed for the first time in 1483, at Venice, by Radolt, who excelled in printing at that time, an edition extremely rare there are others of 1492, 1521, 1545, &c

Alphonsus has been accused of Blasphemy and impiety for having said, "that if God had asked his advice when he made the world, he would have given him better council." If he really made use of this language, it must have been meant only with an allusion to the absurdities of the Ptolemaic system, which, as an astronomer, he could not but condemn. Still however, after making every allowance, this language is so highly irreverent as to demand censure, if indeed we could give credit to the story; but it rests chiefly on a vulgar tradition, and as it is incompatible with the character of Alphonsus, who is said to have read the Bible fourteen times, we think it better to deny its probability, than to lay much stress upon any apology for it.

**ALPHUS** (*alac, white*) Vitiligo alba. Morphaea alba. Lepra maculosa alba. A species of leprosy with white spots, as those of the elephantiasis are black. It is produced by a peculiar miasma local to Arabia and the neighbouring countries.

**ALPINIA** In botany, a genus of the class and order monandria monogynia. Calyx three-toothed, equal, tubular, corol three parted, equal, nectary two-lipped, the lower lip expanding. It affords four species, which are natives of the East or West Indies.

**ALPS**, a range of high mountains, separating Italy from Gaul and Germany, in the form of a crescent. They take their rise from the Vada Sabatia, or Savona, and reach to the Sinus Flanensis (now Golfo di Camaro of the Adriatic), and the springs of the river Colapis (now the Kulpe), extending, according to Livy, 2000 stadia in length, or 250 miles they are divided into several parts, and accordingly have different names. From Savona to the springs of the Varus, where the Alps lie against the Sea of Genoa, they are called Maritime, now le Montagnes de Tenda. These extend from south to north, between Gaul to the west and Genoa to the east, beginning at Monaco on the Mediterranean; then running out through the east of the county of Nice, and between that and the marquisate of Saluzzo, terminate at length at mount Viso, between Dauphiné and Piedmont.

The Alps are the highest mountains in Europe; being, according to some geographers, about one mile in perpendicular height. They begin in the Piedmontese, and stretching northward, between Piedmont and Savoy, to the Swiss mountains, whence directing course to the east, they form the boundary between Switzerland and Italy, and terminate near the extremity of the Adriatic Sea, north-

east of Venice. It was over the western part of those mountains, towards Piedmont, that Hannibal forced his passage into Italy.

**ALPS, LOWER, DEPARTMENT OF**, is one of the four departments composed out of the ci-divant Provence in France. Its chief town is Digne, its superficies about 1,459,700 acres, and its population about 144,440 individuals.

**ALPS, UPPER, DEPARTMENT OF**, makes a part of Dauphiné, which contains three. Its chief town is Gap; its superficies about 1,084,620 acres, and its population 116,750 persons.

**ALPS, MARITIME, DEPARTMENT OF**, is formed of the county of Nice. Its chief town is Nice; its superficies about 632,620 acres; and its population 93,370 individuals.

**ALPUJARAS, or ALFUXARRAS**, a famous ridge of high mountains of Granada, in Spain. These mountains are inhabited by Moors who have received the Roman catholic religion, but retain their old way of living. Their language is a mixture of the Arabic and Spanish.

**ALQUIFOU, ALQUIFOUX, or ARQUIFOU**, is a sort of mineral lead, ore of lead, or galena. It is very heavy, easily reduced into powder, and hard to melt. In England it is called potter's ore, because the potter uses it as a green varnish, when mixed with manganese, it is used to glaze their ware of a blackish colour.

**ALRAMECH**, the Arabic name of Anturus.

**ALRATHIA** (*alratka, an fuselash, Arab.*) A partial or total imperforation of the vagina.

**ALREADY, ad** (*from all and ready*) At this present time, at some time past (*Past*).

**ALRESFORD**, a town, in Hampshire, with a market on Thursday, and a small manufacture of linseys. Lat 51. 6 N. Long. 1. 1 W.

**ALS, ad** (*als, Dutch.*) Also (*Spenser*).

**ALSACE**, a late province of France, bounded on the E by the Rhine, on the S by Switzerland, on the W by Lorraine, and on the N by the palatinate of the Rhine. It formerly belonged to Germany, but was given to France by the treaty of Munster. It is one of the most fruitful provinces of Europe, abounding in corn, wine, wood, other fruits, flax, tobacco, &c. Here are mines of silver, copper, and lead. The original inhabitants are honest and good-natured, but addicted to their own manners and customs. Their language is the German, mixed with a little French.

**ALSO, in music**, an expression signifying accompanied with this character signifies that the performer is to play with music in the composition, the first part of the strain.

**ALSEN**, an island, in the Baltic, near the coast of Denmark, to the N. of the Sound, separated from the main land by a narrow channel, called Alsen-Sund, 6 leagues long, and 2 leagues wide. Lat 56 N. Long. 9° 35 E. Ferro. Lat 56 N.



# ALT

**ALSENS**, a river of Germany which runs into the Ill. near Pludentz

ALZENS, a town of Germany, in the circle of the Upper Rhine, and duchy of Deux-Ponts twenty-eight miles W Worms, and six ENE Meisenheim

**ALSENZ**, a town of Germany, in the circle of the Upper Rhine, and principality of Nassau Weilburg seven miles S Creutznach, and forty NW Mannheim

ALSFELD, a town of Germany, in the circle of the Upper Rhine, in Upper Hesse, eighteen miles E. Marburg, fifty NE. Frankfurt on the Main. Long 26 55 E. Ferro Lat 50 33 N.

**ALSINE.** Chickweed. A genus of the class and order pentandria trigynia. Calyx five-leaved; petals five, equal, capsule beaked, three-valved, seeds numerous. It has three species, which are natives of Europe, a vegetable and a mucronata, common to France and Italy, and a media, a very troublesome weed met with too frequently in our own gardens; but which, if boiled till tender, may be eaten like spinach, and which forms also an excellent emollient poultice.

**ALSINELLA** See **SAGINA**

ALSINGDEES. See BUFORIA and MON-

**AL-SIRAAT** in the Mahometan theology, a bridge laid over the middle of hell, finer than a hair, and sharper than the edge of a sword, over which people are to pass, after their trial, on the day of judgment.

**ALSIUM**, in ancient geography, a city of Italy in Etruria, occupying the spot where Pisa now stands.

ALSO *ad.* (from *all* and *so*) In the same manner; likewise (Burnett)

ALSTON MORE, a town in Cumberland,  
with a market on Saturdays Lat 54 50 N  
Long 2 14 W

**ALSTHEMERIA** In botany, a genus of the class and order hexandria, monogynia. Corol six-petalled, somewhat two-lipped, the two lower petals tubular at the base, stamens declining. It has six species, all natives of South America.

ALT. a river of England, which runs into the Irish Sea, 7 miles W of Ormskirk, in Lancashire.

**ALTO**, in music, a term applied to that part of the great scale of sounds which lies between F above the treble clef note, and G in altissimo.

The **Altay Mountains**, in geo-  
 graphy, a chain of mountains in the northern  
 part of Asia, forming the most extensive  
 of the globe. They are divided into the Great  
 Altay, the Lesser Altay, and the Altay Range.  
 The former separates the Caspian Sea from the  
 Arctic Ocean, and the latter separates the  
 Caspian Sea from the Gulf of Persia. The  
 Altay Range, which is the highest of the

re minutely described in *Journal of the Royal Microscopical Society*, vol. 1, p. 118, &c.; vol. 11, p. 10.

# ALT

**ALTAIR**, or **AITAYR**, in astronomy, a star of the first magnitude, marked  $\alpha$  in Aquila

**ALTAR**, a place upon which sacrifices were anciently offered to some deity. The heathens at first made the altars only of turf; afterwards they were made of stone, or marble, of wood, and even of horn, as was that of Apollo in Delos. Altars differed in figure as well as in materials. Some were round, others square, and others triangular. All of them were turned towards the east, and stood lower than the statues of the gods, and were generally adorned with sculpture, representing either the gods to whom they were erected or their symbols.

According to Servius, those altars set apart for the honour of the celestial gods, and gods of the higher class, were placed on some pretty tall pile of building; and for that reason were called *altaria*, from the words *alta* and *ara*, "a high elevated altar." Those appointed for the terrestrial gods were laid on the surface of the earth, and called *arae*. And, on the contrary, they dug into the earth and opened a pit for those of the infernal gods, which they called *sepas infernales*, "serobiculi." But this distinction is not every where observed: the best authors frequently use *ara* as a general word, under which are included the altars of the celestial and infernal, as well as those of the terrestrial gods.

Altars are doubtless as ancient as sacrifices themselves, consequently their origin is not much later than that of the world, (Gen. ch. i.) Some attribute their origin to the Egyptians, others to the Jews, others to the patriarchs before the flood. Some carry them as far back as Adam, whose altar is much spoken of by Jewish and even Christian writers. Others are contented to make the patriarch Enoch the first who consecrated a public altar. Be this as it will, the earliest altars we find any express testimony of are those erected by Abraham.

Among the Jews, altars in the patriarchal times were very rude. The altar which Jacob set up at Beth-el was nothing but a stone, which served him instead of a bolster, that of Gideon, a stone before his house and the first which God commanded Moses to erect was probably of earth, or unpolished stones, without any iron; for if any one was made of that metal, the altar was declared impure.

The principal altars of the Jews were, the altar of incense; that of burnt-offering, and the altar, or table, for the shew-bread.

The altar of incense was a small table of acacia-wood, covered with plates of gold, of one cubit in length, another in width, and two cubits in height. At the feet corner, were four kinds of incense, and all round a velvet border of crimson wool. The altar was also hidden by a curtain of gold and blue, and upon it the Jews made their sacrifices, and upon it the

the failure of a particular composition  
is a case of error of judgment made of  
the wrong kind, and centers upon the knowledge  
of the nature of slaves of the West coast over-

land with brass. In the time of Moses, this altar was five cubits square, and three high, but in Solomon's temple it was much larger, being twenty cubits square, and ten in height. It was covered with brass, and at each corner was a horn or spire, wrought out of the same wood with the altar to which the sacrifices were tied. Within the hollow was a grate of brass, on which the fire was made, though it fell the ashes, and were received in a pan below. At the four corners of the grate were four rings and four chains, which kept it up at the horns. This altar was placed in the open air, so that the smoke of the burnt-offerings might not sully the inside of the tabernacle.

The altar, or table for the shew-bread, was likewise of shittim-wood, covered with plaques of gold, having a little border round it, adorned with sculpture. It was two cubits long, one wide, and one and a half in height. Upon this table, which stood in the holy of holies, were put, every sabbath-day, twelve loaves, with salt and incense.

The Jewish altars, after their return from the captivity, and the building of the second temple, were in some respects different from those described above. That of burnt-offerings was a large pile, built of unhewn stone, thirty-two cubits square at the bottom, and twenty-four square at the top. The ascent was by a gentle rising, thirty-two cubits in length, and sixteen in breadth.

ALTAR is also used among Christians for the communion table. In catholic countries, the altar is sometimes sustained on a single column, as in the subterraneous chapels of St Cecilia, at Rome, &c. and sometimes by four columns, as the altar of St Sebastian of Crypta Arenaria, but the customary form is, a massive of stone-work, sustaining the altar table. These altars bear a resemblance to tombs to this purpose, we read in church history, that the primitive Christians chiefly held their meetings at the tombs of the martyrs, and celebrated the mysteries of religion upon them, for which reason, it is a standing rule to this day in the church of Rome, never to build an altar without inclosing the relics of some saint in it.

ALTARAGE *s* (*altarium*, Latin) An emolument arising from oblations (*Ayliffe*).

ALTAR CLOTH *s* (from *altar* and *cloth*) The cloth thrown over the altar in churches (*Prebary*).

ALTAR-THANE, in old law books, a parson of a parish.

ALTDORF, a trading town of Hungary. Lat 49 12 N. Lon 21 15 E.

ALTDORF, or AITOKF, a large handsome town of Switzerland, having four churches and two convents. Lat 46 50 N. Lon 8 30 E.

ALTENBERG, a town of Germany, in the duchy of Stiria eight miles S Weitsburg.

ALTENBERG, a town of Germany, in the circle of Upper Saxony six leagues S Dresden.

ALTENBURG, or OVAR, a town of Hungary, seventeen miles S Presburg, forty SE. Vienna. Long 41, 15 E. Ferro, Lat 47 56 N.

ALTENBURG, a town of Germany, in the duchy of Suria, on the Saane eight miles SSW Windisch Gratz.

ALTENBURG, or OLDENBURG, a town of Germany, in the duchy of Hildesheim, on a river, which runs into the Baltic, about three leagues to the east, nineteen leagues north east Liunburg, and fourteen east Kensburg. Long 10 52 E. Ferro. Lat 54 18 N.

ALTENBURG, a town of Germany, in the circle of Upper Saxony, the capital of a principality twenty miles S Leipsic, fifty two W Dresden. Long 30 8 E. Ferro. Lat 50 56 N.

ALTENBURG, a town of Germany, in the circle of the Upper Rhine, and bishopric of Spire two miles NW Brunsol, and nine SSE Spire.

ALTENBURG, a town of Germany, in the circle of the Upper Rhine two miles NW Wetzlar, and two NE Braunsels.

ALTENBURG, a town of Germany, in the county of Tyrol nine miles NE Glurns.

ALTENBURG, a town of Germany, in the archduchy of Austria two miles SW Horn.

ALTENBURG, (Teutsch), a town of Germany, in the archduchy of Austria, near Hainburg.

To ALTER *v* *a*. (*alterer*, French) 1. To change, to make otherwise than it is (*Stillingfleet*). 2 To take off from a persuasion, practice, or sect (*Dryden*).

To ALTER *v* *n*. To become otherwise than it was, to be changed; to suffer change.

ALTERABLE *a* (from *alter*, *alterabilis*, Fr.) That may be altered or changed by something else (*Swift*).

ALTERABLENESS *s* (from *alterable*). The quality of being alterable.

ALTERABLY *ad* (from *alterable*). In such a manner as may be altered.

ALTERAGE *s* (from *alter*) The breeding, nourishing, or fostering of a child (*Darby*).

ALIFRANT *a* (*alterant*, French) That has the power of producing changes in any thing (*Bacon*).

ALTERANTIA ALTERATIVES (from *altero*, to change, or *alter*) Medicines which produce a re-establishment of the healthy functions of the animal economy, without any perceptible operation.

ALTERATION *s* (from *alter*, *alteration*, French) 1. The act of altering or changing (*Hooker*). 2 The change made (*Hooker*).

ALTERATION, ALTERNATION, or PERMUTATION, of quantities or things, is the varying the order or position of them.

Thus two things, or quantities,  $a$  and  $b$ , may either of them stand first, as  $a$  and  $b$ , or  $b$  and  $a$ , making  $1 \times 2 = 2$ , alternations. Three things  $a$ ,  $b$ , and  $c$  may stand three different ways,  $a$ ,  $b$ , and  $c$ , or either of the positions  $a$ ,  $c$ , or  $b$ , and the other two, for it may stand either before, or between, or after them, thus making  $3 \times 2 \times 1 = 6$ , the changes of three things. In like manner, it will appear that with four things there may be four times as many

## A L T

changes as with three, making  $1 \times 2 \times 3 \times 4 = 24$ . And so on, always multiplying the last found number of alternations, by the ordinal number of the next thing added. For example, the number of changes which may be rung on twelve bells, will be expressed by the product of  $1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8 \times 9 \times 10 \times 11 \times 12 = 479,001,600$

**ALTERATIVE** *a* (from *alter*) Medicines called *alteratives*, are such as have no immediate sensible operation, but gradually gain upon the constitution, by changing the state of the humours (*Quincy*)

**ALTERCATION** *s* (*altercation*, Fr) Debate, controversy, wrangle (*Hakewill*)

**ALTERN** *a* (*alternus*, Lat) Acting by turns (*Milton*)

**ALTERNACY** *s* (from *alternate*) Action performed by turns

**ALTERNATE** *a* (*alternus*, Lat) Being by turns; one after another; reciprocal (*South*)

**ALTERNATE** *s* (from the *adj*) That which happens alternately; vicissitude not generally used (*Prior*)

**TO ALTERNATE** *v a* (*alternare*, Latin) 1 To perform by turns (*Milton*) 2 To change one thing for another reciprocally (*Crow*)

**ALTERNATE ANGLES**, in geometry, are the internal angles A and B (fig. 3 pl. 15), or a and b, made by a line cutting two parallel lines, and lying on opposite sides the cutting line. It is the property of these angles to be always equal to each other; viz. the angle A = the angle B, and the angle a = the angle b. The exterior alternate angles are also equal, namely, C = D, and c = d.

**ALTERNATE RATIO, or PROPORTION**, is the ratio of the one antecedent to the other, as of one consequent to the other, in any proportion, in which the quantities are of the same kind. So if A, B, C, D,

then alternately, A is to B, as C is to D.

**ALTERNATE** (*alternus*) Branches, leaves, peduncles, or flowers, coming out one after or above another, in a regular succession or gradation. Contrasted with *opposite*.

**ALTERNATELY-PINNATE LEAF** In botany, when the leaflets or component leaves are arranged alternately on each side of the common petiole.

**ALTERNATION**. See **ALTERATION**.

**ALTERN, ALTERNATIVE, ALTERNUS** (from *alter*, another) In botany, leaves or shootings, not opposite to each other, but first one and then another.

**ALTERNATIVE** *s* (*alternans*, Fr.) The choice given of two things; so that if one be rejected, the other must be taken (*Planch*)

**ALTERNATIVE** *s* (from *alternare*)

**ALTERNATIVE** *s* (from *alternare*)

**ALTERNATIVE** *s* (from *alternare*)

**ALTERNATIVE** *s* (from *alternare*)

## A L T

**ALTES**, in ancient geography, a town of Peloponnesus, situate on the Caldaus which fell into the river Alpheus

**ALTHA**, in ancient geography, a town of Babylonia, upon the Tigris, and in dependence upon Apamea, according to Ptolemy

**ALTHÆA** (from *αλθεω*, to heal so called from its supposed vulnerary qualities) Marsh-mallow. A genus of the class and order monadelphus polyandria, with a double calyx, the exterior divided into from six to nine segments, with a fruit consisting of numerous capsules, each containing a single seed. It has nine species, of which the *a. acutis*, or holly-hock, is one. A officinalis of Linneus. Folia simplicibus tomentosis. The medicinal part of the plant consists in its gluten or mucilaginous matter, with which indeed it abounds in consequence of which it is employed as an emollient and demulcent in coughs and catarrhs. Its root had formerly a place in several preparations of the dispensary; but it is now seldom used but in the form of syrup.

**ALTHÆA FRUTEX**. A species of *HIBISCUS*, which see.

**ALTHÆMENES**, a son of Creteus king of Crete. Hearing that either he or his brothers were to be their father's murderer, he fled to Rhodes, where he made a settlement to avoid becoming a parricide. After the death of all his other sons, Creteus went after his son Althæmenes, when he landed in Rhodes, the inhabitants attacked him, supposing him to be an enemy, and he was killed by the hand of his own son. When Althæmenes knew that he had killed his father, he entreated the gods to remove him, and the earth immediately opened, and swallowed him up. *Apollod*

**ALTHITH** (*althith*, Arab) Asafoetida. The gum of the ferula asafoetida. See **ASA-FOETIDA**.

**ALTHOUGH** *conj* (from *all* and *though*) Notwithstanding; however (*Swift*)

**ALTICA**. A name given by Fabricius to various species (constituting a tribe) of the coleopterous insect **CHRYSOMELA**, which see.

**ALTILLOQUENCE** *s* (from *altus* and *loquor*, Lat) High speech, pompous language.

**ALTIMETRY, ALTIMETRIA**, the art of taking or measuring altitudes or heights, whether accessible or inaccessible. The word is compounded of *altus*, high, and *metron*, meter, to measure.

**ALTISONANT, a** (*altisonus*, Lat) High-sounding; pompous in sound.

**ALTISSIMO**, a term in music, applied to all notes situated above F in alt; i. e. such notes as are more than an octave above F on the high line of the treble clef.

**ALTITUDE** *s* (*altitudo*, Lat) 1. Height of places, measured upward (*Dryden*). 2. The elevation of any of the heavenly bodies above the horizon (*Brown*). 3. Situation with regard to lower things (*Ray*). 4. Height of exaltation, superiority (*Swift*). 5. Height of degree, highest point (*Shaks*).

**ALTITUDE**, in geometry, is the third dimension of body, considered with respect to its

# AL T I T U D E

elevation above the ground and is otherwise called its height or depth, the former, when measured from bottom to top, the latter when measured from top to bottom

*Altitude of a figure*, is the distance of its vertex from the base, or the length of a perpendicular let fall from its vertex to the base. The altitudes of figures are useful in computing their areas or solidities

*Altitude*, or height of any point of a terrestrial object, is the perpendicular let fall from that point to the plane of the horizon. Altitudes are distinguished into accessible and inaccessible

*Accessible Altitude* of an object, is that to whose base there is access, to measure the nearest distance to it on the ground, from any place

*Inaccessible Altitude*, of an object, is that to whose base there is not free access, by which a distance may be measured to it, by reason of some impediment, such as water, wood, or the like

*To measure or take Altitudes* If an altitude cannot be measured by stretching a string from top to bottom, which is the direct and most accurate way, then some indirect way is used, by actually measuring some other line or distance which may serve as a basis, in conjunction with some angles, or other proportional lines, either to compute, or geometrically determine, the altitude of the object sought

There are various ways of measuring altitudes, or depths, by means of different instruments, and by shadows or reflected images, on optical principles. There are also various ways of computing the altitude in numbers, from the measurements taken as above, either by geometrical construction, or trigonometrical calculation, or by simple numerical computation from the property of parallel lines, &c

The instruments mostly used in measuring altitudes, are the quadrant, theodolite, geometrical square, line of shadows, &c, the descriptions of each of which may be seen under their respective names.

*To measure an Accessible Altitude Geometrically* Thus, suppose the height of the accessible tower AB be required. First, by means of two rods, the one longer than the other plant the longer upright at C, then move the shorter back from it, till by trials you find such a place, D, that the eye placed at the top of it at E, may see the top of the other, F, and the top of the object B straight in a line. Next measure the distances DA or EG and DC or EH, also HF the difference between the heights of the rods then, by similar triangles, as EH : EG :: HR : the 4th proportional GB, to which add AG or DE, and the sum will be the whole altitude AB sought. Fig. 1. pl. 12.

Or, with one rod CF only: plant it at such a place C, that the eye at the ground, or near it, at L, may see the tops F and B in a right line then, having measured LC, LA, CL, the 4th proportional to these will be the altitude AB sought.

Or thus, by means of shadows. Plant a rod ab at a, and measure its shadow ac, as also the shadow AC of the object AB, then the 4th proportional to ac, ab, AC will be the altitude AB sought. Fig. 6

Or thus, by means of optical reflection. Place a vessel of water, or a mirror or other reflecting surface, horizontal at C, and move off from it to such a distance, D, that the eye E may see the image of the top of the object in the mirror at C then, by similar figures, CD DE CA AB the altitude sought. Fig. 7

Or thus, by the geometrical square. At any place, C, fix the stand, and turn the square about the centre of motion, D, till the eye there see the top of the object through the sights or telescope on the side DE of the quadrant, and note the number of divisions cut off the other side by the plumb-line EG then as EE FG : DH HB, to which add AH or CD, for the whole height AB. Fig. 2

*To measure an Accessible Altitude Trigonometrically* At any convenient station, C, with a quadrant, theodolite, or other graduated instrument, observe the angle of elevation ACB above the horizontal line AC, and measure the distance AC. Then, A being a right angle, it will be, as radius is to the tangent of the angle A, so is AC to AB sought. Fig. 4

If AC be not horizontal, but an inclined plane, then the angle above it must be observed at two stations C and D in a right line, and the distances AC, CD, both measured. Then, from the angle C, take the angle D, and there remains the angle CDB, which in the triangle BCD, are given the angles and the side DC, to find the side CB, and then in the triangle ABC, are given the two sides CA, CB, with the included angle C, to find the third side AB. Fig. 5

Or thus, measure only the distance AC, and the angles A and C then, in the triangle ABC, are given all the angles and the side AC, to find the side AB

*To measure an Inaccessible Altitude*, as a hill, cloud, or other object. This is commonly done, by observing the angle of its altitude at two stations, and measuring the distance between them. Thus, for the height AB of a hill, measure the distance CD at the foot of it, and observe the quantity of the two angles C and D. Then, from the angle C taking the angle D, leaves the angle CBD, hence As sine CBD : sine D :: CD : CB, and As radius : sine ACB :: CB : AB the altitude. Fig. 8

When this method is used to find the altitude of a cloud, balloon, or other inaccessible object, the angles of its altitude must be taken at the same moment by two stations, who are situated in a vertical plane, and see with them through the object.

When an object can neither be approached to, nor receded from, in the best direction of sight, its altitude may still be found without having recourse to horizontal angles, thus: Let any two distances CD=D, DE=D

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(fig. 4.) be measured in a right line lying in the same horizontal plane with the bottom B of the vertical object, and at the points C, D, E, let the angles of elevation ACH= $a$ , ADB= $b$ , AFE= $c$ , be taken, then we have the height AB of the object

$$= \frac{D \cot \delta}{\sqrt{D \cot^2 a + d \cot^2 c - 2 \cot^2 b}}$$
, where  $r$  is the radius and  $\delta = D + d = CE$ . If  $CD = DE$ , or  $D = d$ , then  $D + d = 2d = \delta$ , and the

altitude  $h = \frac{r d}{\sqrt{(\frac{1}{2} \cot^2 c + \frac{1}{2} \cot^2 a - \cot^2 b)}}$ , from

which we have this logarithmic rule — Double the log. cotangents of the angles of elevation at the extreme stations, find the natural numbers answering thereto, and take half their sum; from which subtract the natural number answering to twice the log cotangent of the middle angle of elevation then, half the log of the remainder subtracted from the log of the measured distance CD or DE, will be the log of the height of the object

It is manifest that in these, or any other methods of ascertaining altitudes trigonometrically, the accuracy of the result will depend upon the accuracy and care with which the angles are taken. Some mathematicians (particularly Mr. Lalande, in his excellent little treatise "De l'astronomie ancienne et moderne") have observed in what manner the result would be affected by any supposed error in the angles. This matter may be exemplified by taking up the most simple case in taking altitudes, namely, when the object is accessible, and perpendicular to the horizon, as AB, fig. 5. It has been found by a fluxional process, that the error of the height AB, is to the error of the error of the angle C, as the error of the height is to the sine of double the observed angle. The error, therefore, which one commits in the determination of the said height, will be the least possible when the sine of double the observed angle is the greatest possible, i. e. when this angle is  $45^\circ$ . Hence appears the propriety of moving to and fro on the horizon, until the observed angle is as near as possible to  $45^\circ$ . If a mistake of one minute in the angle be committed in the determination of the height, then, if radius be  $\equiv 10000000$ , the error of a minute, which measures the supposed error, will be 89999, the double of which is 179998, and this quantity is to the sine of double the angle  $45^\circ$ , i. e. to radius, as 1 to 1710, therefore on this supposition the error in the height will be 171000 parts of the height itself. If the error of the angle C be increased or diminished, the error of the height will be increased or diminished in the same ratio. And if the angle observed be greater or less than  $45^\circ$ , the error of the height will be increased or diminished in the same ratio to the sine of double the observed angle.

Other methods of ascertaining altitudes, may be seen in Dr. Hutton's "Mathematical Dictionary" on "Astronomy," and in Mr. Boscovich's "Tractatus de Astronomia," and most other works on "Astronomy."

There is a very easy method of taking

terrestrial altitudes, such as mountains, &c. by means of the difference between the heights of the barometer observed at the bottom and top of the same, which see under the article BAROMETER.

*Altitude of the Eye*, in perspective, is a right line let fall from the eye, perpendicular to the geometrical plane.

*Altitude of the Pyramids in Egypt*, was measured so long since as the time of Thales, which he effected by means of their shadow, and that of a pole set upright beside them, making the altitudes of the pole and pyramid proportional to the lengths of their shadows. Plutarch has given an account of the manner of this operation, which is one of the first geometrical observations we have an exact account of.

*Altitude*, in astronomy, is the arch of a vertical circle, measuring the height of the sun, moon, star, or other celestial object, above the horizon.

This altitude may be either true or apparent. The apparent altitude is that which appears by sensible observations made at any place on the surface of the earth. And the true altitude is that which results by correcting the apparent, on account of refraction and parallax.

The quantity of the refraction is different at different altitudes, and the quantity of the parallax is different according to the distance of the different luminaries. In the fixed stars this is too small to be observed, in the sun it is only about  $8\frac{1}{2}$  seconds; but in the moon it is about 58 minutes, at a mean.

The altitude of a celestial object may be very accurately determined, by measuring the arc of an oblique great circle intercepted between the star and the horizon, and the inclination of the same great circle to the horizon. This may be put in practice by means of the equatoreal, thus let the sine of the estimated altitude of the object be  $s$ , elevate the equatoreal circle above the horizon to an angle, the sine of which  $\equiv \sqrt{s}$ , rad being  $\equiv 1$ . The declination circle being set to 0, direct the line of collimation to the star, by the equatoreal and azimuth circles moved in their own planes, observe the arc of the equatoreal circle intercepted between the index and VI, if the sine of this arc  $\equiv p$ , the sine of the observed altitude will be equal to  $p \sqrt{s}$ , radius being 1. This indirect method has many advantages; and is, in general, less exposed to errors than the direct method in about the proportion of 1 to 7. Atwood's Lectures, p. 198, 227.

*Meridian Altitude of the Sun, or any celestial object*, is an arch of the meridian intercepted between the horizon and the centre of the object upon the meridian. The altitude of a celestial body is greatest when it comes to the meridian of any place (the poles of the earth excepted, for there the altitude of a fixed body is subject to no variation); and the altitude of any star which sets not, is least, and the depression of any star which does set, is greatest, when in the opposite part of the meridian.



## A L T

*Altitude of the Pole*, is an arch of the meridian intercepted between the horizon and the pole it is equal to the latitude of the place

*Altitude of the Equinoctial*, is the elevation of that circle above the horizon, and is always equal to the complement of the latitude

*Refraction of Altitude*, is an arch of a vertical circle, whereby the altitude of a heavenly body is increased by refraction And *Parallax of Altitude*, is an arch of a vertical circle whereby the altitude is decreased by parallax

*Altitude of the Earth's or Moon's Shadow*, in eclipses See ECLIPSE

*Altitude Instrument, or Equal Altitude Instrument*, one used to observe a celestial object when it has the same altitude on the east and west sides of the meridian.

Observations of this kind are made for the purpose of obtaining the true time of the sun's passing the meridian various modes of calculation have been recommended at different times, but we know of none (independent of tables) that is preferable to the following method of deducing the true time of the sun's passing the meridian, by the clock, from a comparison of four equal altitudes, observed on two succeeding days The rule was invented by the celebrated Dr Birtwhistle, the American astronomer.

Suppose there are four sets of altitudes obtained on two successive days, (viz one set in the morning, and one in the afternoon of each day), the instrument being kept at exactly the same height both days, then the exact time of the sun's passing the meridian per clock, may be readily obtained by the following

*Rule* Take the difference in time between the forenoon observations of the two days, and also between the afternoon observations Call half the difference of the two differences, X, And half the sum of the two differences, Y, Let the half interval between the two observations of the same day, be Z

Then, if the times of the altitudes observed on the second day be both nearer 12, or both farther from 12 per clock, than on the first day X will be the daily variation of the clock, from apparent time, and Y will be the daily difference, in time, of the sun's coming to the same altitude, arising from the change of declination And the proposition will be  $24^{\text{th}}$  Y Z E, the equation sought which will be found the same (without any sensible difference) as the equation obtained from the tables

But of one of the observations on the second day be nearer 12, and the other more remote from 12, than on the first day, then Y will become the daily variation of the clock from apparent time, and X will be the daily difference in time of the sun's being at the same altitude And the proportion will be  $24^{\text{th}}$  X Z E

The equation, E, thus obtained, is to be subtracted from the mean noon, if the sun's meridian altitude be daily increasing, but to be

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added, if it be daily decreasing The reason of all this is very plain, and its mode of application so obvious that it is needless to give examples in this place several, however, may be seen in the first volume of the American Transactions, whence the rule was extracted

*Altitude, circles of, parallels of, quadrant of, &c* See the respective words

ALLMORI, a town of Ireland, in the county of Lymon Lat 54 30 N Lon 7. 18 W

AITO, in music, the highest natural tenor voice

ALTO FT BASSO, or in *Alto* and in *Basso*, in law, signifies the absolute reference of all differences small and great, high and low, to some arbitrator or indifferent person

ALTO RIPIENO, in music The tenor of the great chorus, which sings or plays in the full part of the concert, occasionally

ALTOLÉ (HLR ad (from all and together) Completely, without restriction, without exception (*Savist*)

ALTON, a town in Hampshire, with a market on Saturday Lat 51. 22 N Lon 0 56 W

ALTORF, or ALTDORE, a district of Nuremberg, in Germany Here is a university, a library, and a physic garden. Lat. 49. 40 N Lon. 11 22 E

ALTOST, a town of Saxony, Germany, Lat. 47 30 N Lon. 9 30 E

ALTRINGHAM, a town of Cheshire with a market on Tuesday Lat 53 24 N Lon 2 34 W

ALVA (Ferdinand Alvarez, duke of) was born in 1508 He distinguished himself by his valour and military skill when young, and in 1538 was made general by Charles V whom he served against the German, protestants, the French, and the pope As Alva, however, was a bigoted catholic, the last service displeased him, and he asked the forgiveness of the pontiff whom he had vanquished Philip II. sent him into the Low Countries in 1567, to reduce them to the Spanish yoke, from which they were about to revolt Here he established a council which was called the Bloody Tribunal He filled the United Provinces with terror and scenes of carnage, for which his memory is held in detestation to this day After obtaining great advantages over the malcontents, the tide of success turned in their favour so rapidly, that Alva, in a fit of dejection, collected his recall, in 1573, which was granted He enjoyed considerable marks of distinction from his sovereign for some time, but at last fell in to disgrace through the misconduct of some of his sons He was afterwards employed in Portugal, where he greatly added to the military renown, by driving out the Moors from the throne, in 1581 He died the same year, aged 74 *Watkins.*

ALUCETA, a name given by Aristotle to various species (constituting a subgenus) of the lepidopterous insect *Phalaena* or *moth*, corresponding with the lines of *Gracilar* See *Phalaena*

## A L U

**ALUDELS**, certain pots or vessels made of earthen-ware or glass, open at both ends, and may be inserted and applied above each other, so that the whole shall form a pipe or tube more or less long according to the number of aludels composing it. The aludel which terminates thus tube above, ought to be closed in its upper part, or to have but a very small opening. The tube composed of these aludels is nothing but a kind of capital or head, which may be enlarged or lengthened at pleasure, and adapted to a cucurbit. This apparatus is intended to collect and retain dry and volatile matters, which may be reduced into flowers by sublimation. It was employed for the preparation of flowers of sulphur, of arsenic, of antimony, of benjamin, &c., but is now generally discarded, since the shops are supplied from wholesale laboratories, where more convenient apparatus are employed. See pl. 11 fig. 7, where A is the cucurbit, B a series of aludels, and C the capital.

**ALVEARIUM**, in anatomy, (from *alvea*, a bee-hive,) that part of the meatus auditorius, or couch of the external ear, which contains its wax.

**ALVEHEZET**, among Arabian writers, denotes what we commonly call falling-stars, or star-shots.

**ALVEOLAE**, (*Alveolus* A. *foveolus*) receptacles. Divided into open cells, like an honey-comb, with a seed lodged in each: as in *Corallum*.

**ALVEOLUS**, in anatomy, the socket-like cavity in the jaws, wherein each of the teeth is fixed.

**ALVEOLI**, in the history of fossils, a matter lately discovered at present in its recent state, and frequently found fossil. The alveoli assume a conical shape, and composed of a number of cells, like so many beehives jointed into one another, with a pipe of communication, like that of the nautilus. They are sometimes met with entire, but more frequently truncated, or with their smaller ends broken off.

**ALVEUS**, in antiquity, a small boat made of the trunk of a single tree.

**ALVEUS**, (from *alvus*, a paunch, being as it were the reservoir whence a fluid is carried.) The tube or channel of a fluid, in medicine, chiefly that of the chyle.

**ALVIONICA**, (*Alvionica* sc. *medicamenta*) Medicines which open the bowels.

**ALVULUS**, A prurging.

**ALUMEN**, (*alum*, Arab.) Alum. A neutral salt formed by a combination of the earth called alumina, alumina, or pure clay, with sulphuric acid. The philosophical and medicinal alum is the same, and is called in the new chemical nomenclature sulphate of alumine acidulus pure potius, but in colloquium with potash or soda it is called alumina vitriolata. It is used in the same way as the alum out of the pot.

For the purpose of being manufactured by the decomposition of the alum, and being it, evaporating the first part, and then crystallizing the alum, which exhibits the form of sublimed pyramids, applied to each other, like to

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base, the angles being occasionally truncated. The following are the chief species of ore.

*Alum native, or fossil* alum found crystallized by nature without the assistance of art.

*Alum plumosum, or plume alum* alum naturally crystallized in the form of threads or fibres resembling feathers.

*Alum prepared, or purified* alum dissolved in pure hot water, (rain or distilled,) and crystallizing after a sufficient evaporation.

*Alum rock, or ice-alum* so named from Rocta, now called Edessa in Syria, where it is found in large transparent masses of native crystallization, but not very pure. It was in this place that the earliest alum manufactories were established of which we have any account.

*Alum Roman*: prepared in the territory of Crivis-Veccia, from native masses not unlike the rock alum. It is imported in lumps of the size of eggs, covered with a reddish tincture.

*Alum saccharum*: a composition of common alum dissolved in rose water, clarified by the whites of eggs, and formed, after boiling to a due consistency, in the shape of a sugar-loaf, whence its name. It is used as a cosmetic.

Alum, on its first taste, imparts a sweetness, but is soon felt to be strongly astringent, on account of which virtue it is of extensive use in medicine and surgery. Internally it is given in hæmoptoe or blood-spitting, colica pictonum, chronic pains of the bowels and enuresis. Externally it is applied as a styptic to bleeding vessels and to phagdenic ulcers.

Exposed to the fire, alum at first becomes liquefied, much aqueous vapour or water of crystallization exhales from it, and it swells into a large white mass, rough and full of crannies all over its surface. This production is termed *alumen ustum* or burnt alum, and is sometimes employed in surgery to destroy fungous flesh, as well as for particular kinds of ophthalmics. Besides this preparation alum enters the aqua aluminis composita, and the coagulum aluminis of the pharmacopœias.

*Alum, or alumen*, dissolves in from ten to fifteen times its weight of cold water, according to its purity, but boiling water will dissolve more than its weight of alum. It crystallizes by evaporation and cooling, the figure of its crystals varying with circumstances half its weight of water is retained in crystallizing. The crystals dissolve in about seventeen times their weight of cold water. Alum swells when heated, loses its regular form and the water which it contained, and becomes a light white substance called burnt, or calcined alum. In a more violent degree of heat it loses part of its acid, and becomes tasteless; is no longer susceptible of crystallization, but precipitates from its solution, in a very fine adhesive powder. Magnesia, baryt, and the alkalis, precipitate it from this solution; but the alkalis, added in excess, re-dissolve it.

By the addition of more alumine the glass soluble of Baumé is formed, which is almost tasteless and insoluble, and exhibits cubic crystals.

If three parts of alum, and one of sour or

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sugar, be melted together in an iron ladle, and the mixture dried till it becomes blackish and ceases to swell, and if it be then pounded small, put into a glass phial, and placed in a sand-bath till a blue flame issues from the mouth of the phial, and after burning for a minute or two be allowed to cool, a substance is obtained known by the name of Homberg's pyrophorus, which has the property of taking fire whenever it is exposed to the open air, especially if the air be moist.

Chaptal informs us that alum is capable also of combining with several other bases, and of forming many triple salts which have never yet been examined with attention.

Of all the various kinds of alum, that distinguished by the name of Roman alum is generally reckoned the best, particularly for the purposes of dyeing, in which art alum is extremely useful, as by means of it a great number of colours are fixed and rendered permanent upon cloth. It constitutes the basis of ceramies, which generally consist of the earth of alum finely powdered and mixed for the purpose. In the preparation of Prussian blue, it prevents the basis of martial vitriol, which is soluble in acids, from being precipitated by the superfluous alkali employed in the preparation of that pigment, that is, the alkali which is not saturated by the colouring matter. As this basis adheres more strongly than the clay to the vitriolic acid, and would form a green by the mixture of its yellowness, the white earth of alum likewise, according to its quantity, dilutes the darker colours, even black itself, and produces an infinite number of shades. It is also of use in the making of candles, for being mixed with the tallow, it gives it a hardness and consistence which it has not naturally. Wood sufficiently soaked in a solution of alum does not easily take fire, and the same is true of paper impregnated with it, which for that reason is very properly employed in preserving gunpowder, as it also excludes the moisture of the air. Paper impregnated with alum is useful in whitening silver, and silversmiths brass without heat. Alum is also of use in tanning, where it assists in restoring the cohesion of the skins almost entirely destroyed by the lime. Vintners fine down their wines, &c. with alum, fishers use it to dry cod-fish with, and bakers have mixed it with the flour to make their bread compact and white, to the last use of it, great objections have been made. The sole reason ascribed for its use is, that corrupt flour being mixed with good thus acquires a proper degree of cohesion, as the aluminous particles equally pervade the whole mass, and render it of a due consistence. Although some writers have maintained that alum is now seldom used in the making of bread, and when used is entirely innocent; yet there is too much reason to believe the contrary, and to fear that the abuse of alum, and other pernicious materials introduced by our bakers, is one lamentable cause of the numerous diseases of children. For the methods of detecting this adulteration, see the article *Bread*.

Dr Willich, in his Domestic Encyclopedia, remarks that one of the most important purposes to which alum may be readily applied, is that of purifying and sweetening water that has become fetid and unfit for use. On long voyages, or at a distance from clear rivers and wells, each gallon requires, according to its impurity, only from five to ten grains of calcined alum, and double or triple that proportion of powdered charcoal, in order to render the most offensive water perfectly sweet and pellucid both ingredients, however, ought to be preserved in close vessels, otherwise their efficacy will be considerably diminished.

*Manufacture of Alum.* This useful salt was first discovered in the eastern countries, from whence it continued to be imported till the 15th century, when the Italians, who had hired the alum works in the neighbourhood of Constantinople, introduced the art of manufacturing it into their own country. In the 16th century it was manufactured in Germany and Spain, and soon afterwards alum works were established in England.

The alum of commerce is usually obtained from the fossils, or ores of alum, or from earths containing sulphur and clay, or sulphuric acid and clay. There are various ways of obtaining it, according to the peculiar process of the country in which it is manufactured, and the materials from which it is procured. The general principles of the operation may be understood from the method practised by professor Chaptal, which has the advantages of simplicity and convenience to recommend it. A common process is to dissolve alumine in the sulphuric acid, by calcining the clay, impregnating it with the acid, and facilitating its action by a heat of from 145 to 167 degrees of Fahrenheit's thermometer, but Chaptal's consists in presenting the acid in vapours, and under the dry form, to the clay properly prepared. For this purpose he calcines his clays, and reduces them into small pieces, which he spreads on the floors of leaden chambers. The sulphuric acid, which is formed by the combustion of a mixture of sulphur and saltpetre, expands itself in the cavity of these chambers, and exists for a certain time in the vaporous state. In this form it has a stronger action than when it had been weakened by the mixture of a quantity of water more or less considerable so that it seizes the earths, combines with them, causes them to increase in bulk by the efflorescence which takes place, and at the end of several days the whole surface exposed to the vapour is converted into alum. Care must be taken to stir these earths from time to time, that they successively present all their surfaces to the action of the acid. But when the process may be used to combine the acid with clay, it is necessary to expose the aluminate earths to the air during a greater or less length of time, in order that the combination may be more accurate, and the saturation more complete. Almost all the alum employed in commerce is afforded by ores which are dug out of the earth for this purpose. All the operations of



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this manufacture may be reduced to four, the decomposition of the ore, the lixiviation of the ore, the evaporation of these lixivia, and the crystallization of the alum. The decomposition of the mineral is effected either in the open air without assistance, or else by means of fire. When the mineral is left to decompose spontaneously, nothing more is necessary than to dispose the stone which contains the principles of alum in strata or layers. The pyrites become heated, acid is formed, which dissolves the clay, and the salt arising from this combination exhibits itself by the efflorescence of the ore. The decomposition may be accelerated by watering the heap of pyrites, and the operation may be still more abridged by the assistance of fire. The method of applying the heat however varies very much. It ought not in general to be either too strong or too weak. In the first case it volatilizes the sulphur, and in the second it retards the operation. The ore of alum is sometimes found impregnated with a sufficient quantity of bitumen to maintain the combustion.

In cases where the ore has effloresced into alum, the salt is extracted by lixiviation. For this purpose the same water is passed over several heaps of aluminous earth, in order to saturate it. The water which is first passed over the earth dissolves in preference the vitriol, which is more or less abundant; and this salt may be separated from the alum by a previous cold washing. This lixivium, or saline solution, is carried into leaden caldrons, where the fluid is properly concentrated. In this part of the process it is that an accurate saturation of the alum is effected when the acid is in excess, and for this purpose alkalis are added, which are likewise singularly to facilitate the crystallization. It has been proposed by professor Bergmann to boil clay with the solution, to saturate the excess of acid. This process would seem in every point of view advantageous, but Mr. Chaptal thinks it unpracticable, because the superabundant acid cannot be made to combine with the clay but by a very long ebullition; and he has remarked, that, by afterwards evaporating the fluid to cruse it to crystallize, this clay falls down, and opposes the crystallization. This ingenious chemist varied the process in different ways, without obtaining the success which its celebrated author predicted. There are methods of greater or less accuracy to judge of the degree of concentration to which it is proper to carry the lixivium, in order to obtain a good crystallization; such as, the immersion of an egg in the liquid, the effusion of some drops of the lixivium on a plate, &c. M. Gayton Morveau has proposed a method of prometer; but this experiment cannot be considered as very accurate, as the reaction in the liquid is not uniform in the heat of the fluid in which it is made. When the lixivium is at length, but for crystallization, it is concentrated, & after it has been crystallized by evaporation, which is the process followed in

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Monsieur Lampadius has discovered a method of preparing alum from pyrites and clay, the former yielding, by combustion, the acid with which the clay is combined. See the Philosophical Magazine, vol. 23, p. 66, &c.

*Alum ustum* See ALUMEN

**ALUMINARIS** In oryctology, a genus of the class earths, order argillaceous consisting almost entirely of alumine meagre to the touch, light, without lustre, earthy, adhering a little to the tongue, shining a little nearly soluble in nitric acid, contracting and hardening in the fire, emitting sparks before the blow-pipe. The only species is a *nativa*. Native argil, native argillaceous earth, native alumine. Earth of alum. Pure clay. Found in various parts of Britain, Muscovy, and Saxony. Pure alumine is contained in a large proportion in common clays, pipe-earth, slate or schistus, steatites and various stones. It is never found pure in its native state with the acids it is known to form more than twenty species of neutral salts, of which alum or aluminous sulphat, is the most common as well as the most useful. The aggregative force of aluminous earth being weak, renders it much more susceptible of combination than other kinds of earth, and accordingly clays are much seldomer found pure than either quartz or rock-crystal. Whence it may be easily inferred, why clays are almost always coloured, and why few of them possess all the properties of the aluminous character in any eminent degree. Aluminous earth suffers an alteration from the action of heat, to which silicious earth is not liable. Instead of remaining like the latter, unchanged when exposed to an ardent heat, it acquires an addition of aggregative force, it even assumes, in such circumstances, some of the properties of the silicious earth, its hardness and aversion to combination. Water acts on aluminous earth, penetrates into its substance, adheres to it, and renders it soft and ductile. The existence of this combination appears from the difficulty with which the adhesion between these two substances is overcome, a strong and long continued heat being necessary to effect a separation between them. The properties which this species of earth possess of composing a paste with water, and becoming hard by the action of fire, render it a very valuable material in the arts (*Fourcroy*). The first of these properties, however, it frequently loses in consequence of the second, for after being well baked, as is the case with bricks and pottery ware, water is incapable of forming it into a paste. To restore this property the alumine must be dissolved in an acid, and precipitated. A considerable degree of heat renders it hard enough to give fire with steel, and it has been made, both by Boyle and by Lavoisier, to cut glass like diamond.

Alumine is capable of combining with a vast number of other bodies; and it is found to be a principle in many compounds, particularly in those stony or earthy masses of which our globe appears to be chiefly composed. With the sulphuric acid, it forms sulphat of

# ALU

alumine, or alum When uncombined, it is infusible, except by the flame of oxygen gas, but when mixed with phosphat or borat of soda, it may be fused as readily as lime and magnesia A mixture of the two latter substances with alumine, forms a porcelain by fusion, but for this purpose the proportion of alumine must be greater than that of lime, and at least equal to that of magnesia

Pure alumine may be obtained by precipitating a solution of alum in water, by the crystallized carbonat of potash To purify it completely from its sulphuric acid, Guyton advises that the precipitate be redissolved in nitric acid, that nitrat of baryte be cautiously added to the solution, till it no longer occasions milkiness, and that the alumine be afterwards precipitated, or separated from the nitric acid by heat Vauquelin and Berthollet procure it from such of the natural clays as contain only silex and alumine, by digestion in muriatic acid, and decomposition of the solution by ammonia Others precipitate it from a solution of alum in water, by ammoniac, and by the carbonat of ammoniac (sal volatile), and Theodore Saussure says this method will afford two kinds of alumine, according to the quantity of water employed in the solution If the water be just sufficient to dissolve the alum, a very light white earth is obtained, which he calls spongy alumine, if a very large quantity of water be employed, the result of precipitation is a transparent mass, yellow and brittle, about ten times the weight of the former, and which he terms gelatinous alumine These two forms differ chiefly in their capacity for retaining water when heated, which is much greater in the gelatinous kind See Philosophical Magazine, vol X p 152

The difficulty of fusing alumine, and its power of contracting as its temperature is increased, render it a very proper substance for indicating the higher degrees of heat On these accounts it has been employed, and very successfully, as a pyrometer, by the celebrated Mr Wedgwood, whose improvements in the manufacture of pottery and china ware, in which alumine is an essential ingredient, entitle him to the esteem and gratitude of his country

**ALUMINE** See ALUMINARIS

**ALUMINOUS**, relating to alumine, or partaking of its nature

**ALUMINOUS SALTS**, are those formed by the combination of the different acids with alumine, or pure clay These salts are in general more imperfect than any of the neutral salts with which chemists are acquainted Their properties, with the exception of alums, have not been accurately investigated, and therefore they are not much known Accounts of these salts will be given under the divisions to which they respectively belong viz that which is formed by the union of alumine with the nitric acid, will be described under nitrat of alumine; that formed with the sulphuric acid, under sulphat of alumine; and so on,

# ALY

according to the name of the acid which enters into the composition of the salt

**ALUMINOUS MURIAT, CARBONAT, &c** the same as MURIAT, CARBONAT, &c of ALUMINE, which see

**ALUN CATIN**, or stone-soda, a sort of semi-vitrified substance, or imperfect soda, formed at Cherbourg by stirring and kneading together with large poles the hot ashes of the plant varech This substance is used in the making of glass

**ALUNTIUM, ALONTIUM** (ancient geography), a town in the north of Sicily, situated on a steep eminence, at the mouth of the Chydas (*Ptolemy, Phny, Cicero*), said to be as old as the war of Troy (*Dionys Halcar*) Now in ruins, from which arose the hamlet St Filadelfo, in the Val di Demona The inhabitants were called Haluntini (*Cicero*).

**ALURNUS** In entomology, a genus of the order coleoptera, which see The generic character is as follows Antennas filiform, short; tentaculi or feelers, from four to six, very short, jaw horny, arched. It comprises only three species—1. A grossus. Feelers six; thorax scarlet, shells yellow, inhabits South America and India—2. A femoratus. Feelers four, brassy-green, thighs and hind-shanks toothed. Inhabits India—3. A dentipes. Feelers four, black; thighs and hind-shanks toothed or dentated. Inhabits the Cape of Good Hope

**ALUTA**, (quasi *abluta*, from *abluo*, to wash.) Cleaned and prepared leather, such as is used to spread plasters upon

**ALUTA**, a village of Palestine, placed by Jerome, near the river Clebron.

**ALVUS**, (Scaliger derives this word from *alluo*, to cleanse; Virgil from *aly* to nourish, as being the reservoir of nutriment.) The abdomen This term is now applied to the state of the intestinal canal; thus, when the bowels are relaxed, it is called *alvus liquida*; when costive, *alvus dura*, and when very costive, *alvus stricta*

**ALWAYS** *ad* (ealle-æga, Saxon.) 1. Perpetually, throughout all time (*Pope*). 2. Constantly, without variation (*Dryden*)

**ALYPON** *Montia Cal* See CONVOLVULUS

**ALYPUM**. See GLOBULARIA

**ALYSSON ROUGHLEAVED** See SUBULARIAS.

**ALYSSUM** Madwort A genus of the class and order tetradynia umbellosa, thus distinguished. Silicle slightly emarginate, angulated, crowned with the style, the calyx concave and crowded with the perianth; some of the filaments generally shorter than the others. There are thirty-three inhabitants of Europe, of which *A. maritimum* or common madwort is the most common in our country, and the *A. montanum* in our corn fields. They are all arranged under three genera, *Alyssum*, with herbaceous stems, and with silicles inflated, or large, strong, and closed.

**A M A**

fore devoted to destruction. They lived to the east of the Lacus Asphaltites, next the Moabites to the south, and the Ammonites to the north. A branch of them dwelt to the south of Canaan.

**AMALFI**, an ancient town of Italy, subject to Naples Lat 40 28 N Lon 14 45 E

**AMALGAM**, in chemistry and the arts, a mixture or alloy of any of the other metals with mercury. The word is formed of the Greek *αμα*, *together*, and *γανω*, *to join or marry*, expressing the close adherence of the substances which compose the amalgam.

As mercury is habitually fluid in the common temperature, and as it is sufficient for most combinations that one of the bodies be fluid, it follows that without the help of heat, mercury may be amalgamated with many of the metals. Hence there are two methods generally used in the making of amalgams. The first is merely by trituration in a mortar, and without heat; the second is by fusing the metal which is to be amalgamated, and by adding to it, when fused, the intended quantity of mercury.

Amalgams are more or less soft according to the proportion of mercury employed. If this be small they become solid, but brittle, and capable of being pulverised, if it be more considerable, a kind of paste is formed which has no ductility or tenacity, and if the proportion of mercury is very great, the amalgam is only distinguished from that substance by an appearance of foulness.

**MAMBYR**, a sum of money formerly paid to the lord, when a maid within his lordship was married. The word is ancient British, and signifies "the price of virginity."

**AMACK**, an island of Denmark, divided from Seeland by a narrow channel, over which are two bridges, which form a communication with the city of Copenhagen. It contains several villages, and about 800 inhabitants.

**AMADABAT**, or **AMADAVAR**, a large, trading, and strong city, the capital of Cambaya, in the East Indies. This city is about 5 miles long, and 17 in circuit. In the town is such an intermixture of gardens and groves, that afar off it has the appearance of a forest. This town was taken by the English East India company's forces, February 12, 1780, under general Goddard, with the loss of only 100 men. Lat. 23, 10 N. Lon. 72 22 E.

**AMADAN**, a town of Persia, in the province of Irak Agha, eighty-five miles NE Isfahan Lon. 48. 36. E Greenwich Lat 35. 20 N

**AMADIA**, a fortress of Asia, in the province of Kurdistan fifty miles SW Betlis.

**AMADOT** *s.* A sort of pear

**AMADOW**, a kind of black match, tender, or touchwood, which comes from Germany. It is made from spongy excrescences, which often grow on old trees, especially oaks, ash, or fir. This substance being boiled in common water, and afterwards dried and well beaten, is then put into a strong ley prepared with saltpetre, after which it is again put to dry in an oven, when it is fit for use.

**AMADOWRY**, a kind of cotton, which comes from Alexandria, by way of Marseilles

**AMADUVADE** A species of finch or fringilla, whose specific character is, brown and reddish spotted with white, beneath yellowish; tail-feathers black with a white spot at the tip. It is called *amandava* by Linnaeus. The species consists of two varieties. See

**AMAIN**, *ad* (from *main*, or *maigne*, old Fr) With vehemence, with vigour (*Dryden*)

AMATU, in the sea-language, a term importing to lower something at once. Thus, to strike amatu, is to lower, or let fall, the topmasts; to wave amatu, is to make a signal, by waving a different vessel, or the like, as a demand that the vessel make her topmasts

AMAR. 2-4-68  
ABALAGO 2-4-68

16. **ADAM BARTLEY**, 1900-1901, was a member of the  
the membership of the [illegible] of [illegible] of  
[illegible] to [illegible] to [illegible] [illegible]  
[illegible]. They were a [illegible] [illegible] [illegible]

The amalgamation of all metals with mercury is much facilitated by heat, and the amalgamation of those metals which unite difficultly with mercury, cannot be effected without heat. For this purpose, the mercury ought to be heated till it begins to rise in vapours, and the metals of difficult fusion, which we suppose to have been previously divided into small parts, ought to be made red by fire, and quickly triturated with the hot mercury. As to the metals which melt before they become red, such as tin and lead, it is sufficient to melt them, and to throw the mercury upon them, stirring a little the mixture and thus the amalgam is made in an instant.

It would be very imprudent to melt metals which require a great heat for their fusion, as copper, for instance, and to add mercury to this melted metal, with an intention to make an amalgam; because not only the greatest part of the mercury would be dissipated in vapours before it could be united to the metal, but also because there would be great danger of explosion from the mercury, which being a rarefiable and volatile body, is capable, like all such bodies, of producing this effect, when suddenly exposed to too great heat. In this and similar instances the most way is preferable. See *Amalgam of Copper*, below.

The specific gravity of amalgams, as of all other alloys, differs from the mean specific gravity of their component parts; sometimes it is greater, at other times less; and according

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to Gullert, the amalgam of silver is of superior specific gravity even to mercury, the heaviest of the two ingredients. Thus, however, is only at a low temperature, for the amalgam of silver, when heated, floats on the surface of mercury.

A solid amalgam of lead, and another of bismuth, on admixture together, have the singular property of instantly becoming fluid (*Henry*).

Amalgams crystallize much more readily, and more distinctly, than metals. They may be decomposed by heat, but the last portion of mercury is not easily driven off, and frequently not at all without volatilizing part of the metals. An amalgam may also be decomposed by the addition of a metal that has a stronger affinity for mercury than that of which the amalgam is composed, and, in particular circumstances, one amalgam may even decompose another.

We shall now describe the methods of preparing the different amalgams, in their alphabetical order, and notice the uses to which they are respectively applied.

*Amalgam of Antimony*, is prepared by melting the antimony in a crucible, withdrawing it from the fire till it is on the point of becoming solid, and at that moment stirring in the mercury, which must have been previously heated to boiling, the mixture is kept fluid by a gentle heat till the combination appears to be perfect. Another method is to divide the antimony into small pieces, put it into a crucible, and add the proper quantity of mercury to fill up the interstices, the mass being then exposed to a heat little less than that required to volatilize the mercury, the whole will in a short time be formed into an amalgam.

*Amalgam of Bismuth*, is very readily formed by triturating that metal with mercury, in a mortar. This amalgam has the peculiar property of so attenuating tin, silver, and especially lead, when any of these metals is added to it, that a part of them passes along with the mercury through chamois leather. This experiment will succeed better, if the lead be first melted with bismuth, and the mercury added to the mixture. If this compound amalgam be digested several days, the bismuth will be separated, and the remainder will be an amalgam of lead.

*Amalgam of Copper*, is prepared with great difficulty in the dry way, because the heat required to fuse that metal will volatilize the mercury with explosion. The moist way is, therefore, preferable, and is thus executed: take a boiling hot saturated solution of sulphat of copper, pour it into a glass, or Wedgewood ware mortar, and add mercury and iron filings; the iron will decompose the sulphat of copper, and precipitate this latter metal in a finely divided state, which by the heat and moderate trituration will unite with the mercury, and the combination may afterwards be perfected by fusion at a gentle heat in a crucible.

This amalgam is useful as a means of resist-

ing copper, for if it be boiled in river water, and then distilled in a retort, and distilled twice by cohobation, the copper is left in the form of a new metal, of the colour of gold, and more ductile than before.

*Amalgam of Gold*, is produced with the utmost facility, in consequence of the high degree of affinity subsisting between that metal and mercury. Leaf gold, by simple trituration with mercury, will form an amalgam in a few minutes, and pieces of gold, though of considerable thickness, by being immersed in pure mercury will, in a few days, be wholly dissolved, even without trituration. In the great way, this amalgam is usually made by heating the laminæ or plates of that metal red hot; the mercury, being previously heated, is then poured upon them, and the mixture is stirred with a little iron rod till it begins to rise into smoke. It is then thrown into a vessel of water, where it coagulates, and becomes manageable. The proportion is about two parts of gold to one of mercury. If there be too much of the latter, the excess may be separated by filtration. The amalgam is of a white colour, and of the consistence of butter. It is much used in gilding, the amalgam being laid or rubbed upon the metal to be gilded, it is exposed to heat, which evaporates the mercury, and leaves the gold upon the surface of the metal. Metal buttons are gilt in this manner. Goldsmiths also amalgamate their gold, for the purpose of rendering it fluid and ductile.

*Amalgam of Iron*. The formation of this amalgam has ever been considered as a matter of extreme difficulty; and some persons have hastily judged it to be impossible. M. Navier, however, succeeded in it by a tedious process of distillation in balnea-mariae. Mr. Arthur Aikin has employed a simpler method, which answers very well. It consists in uniting an amalgam of zinc, with iron filings, and then adding muriat of iron. A decomposition takes place, and there is produced a muriat of zinc, and the amalgam of iron with mercury, which by kneading, and the aid of heat, assumes the metallic lustre.

*Amalgam of Lead*, is made by melting a proper quantity of lead in an iron crucible, and, when the metal is a little cooled, pouring to it an equal weight of clean mercury. The mixture is then to be stirred with an iron rod, and when cold, the amalgam will appear in the form of a softish brittle mass. This may be made still softer by trituration; and, if it be then put into a glass mortar, and ground, any quantity of mercury may be united to it as pleasure, and they will combine as readily as salt with water. Bismuth promotes the action of mercury upon lead in a remarkable manner. Mercury impregnated with one fourth, one eighth, one twelfth its weight of bismuth, dissolves masses of lead, in a gentle warmth, without the agitation, or triture, or comminution, or melting heat, necessary for uniting lead with pure mercury.

*Amalgam of Platina*, was attempted by Dr. Lewis, who hardly succeeded after a laborious

repetition of experiments for several weeks. M. Guyton succeeded by means of heat. But a much more expeditious method has been lately discovered by count Mousin Pouschin. He took a dram of the orange-coloured salt, composed of oxide of platinum and ammonia, and triturated it with an equal weight of mercury in a mortar of chalcidony. In a few minutes the salt became brown, and afterwards acquired a greenish shade. The matter was reduced to a very fine powder. Another dram of mercury was added, and the trituration continued; the matter became grey. A third dram of mercury began to form an amalgam, and six drams made the amalgam perfect. The whole operation since lasted twenty minutes. Mercury was added till it amounted to nine times the weight of the salt, and yet the amalgam continued very tenacious. It was easily spread out under the pestle, it received the impression of the most delicate seals, and had a very close and brilliant grain.

*Amalgam of Silver*, is made in the same manner as that of gold, by heating the plates or grains of silver, and applying them red hot to the mercury, or the silver may be previously dissolved in nitrous acid (aqua fortis), and then precipitated. This amalgam has the singular property, at the common temperature, of being heavier than either of the metals of which it is composed, as was first observed by Geilston. This amalgam is much used in the operation of silvering, as that of gold is for gilding; and also in making the *Albor Diana*, or the *Philosophical Tree*.

Mercury is also amalgamated with silver and gold, for the purpose of separating these metals from their ores, the mercury is applied to the ore, then dug, prepared to receive it, and the metals, having a less affinity for the ore than for the mercury, leave the former, and form amalgams with the latter. These amalgams being exposed to heat, the mercury is driven off, and the metal remains behind. This process is detailed more fully under the words *ASSAYING, SMELTING, and ORES*. See also *AMALGAMATION*.

*Amalgam of Tin*, is prepared in the same manner as that of lead, by pouring heated mercury into melted tin. This is much used for gilding mirrors, and enabling them to represent images more sensibly and perfectly. It was formerly employed in the preparation of mercury bala for purifying water; these were composed of four parts of tin and one of mercury, and were suspended in water, which was at the same time boiled, to purify it from extraneous matter. Dr. Canton observed that a small quantity of this amalgam, with a very little spirit of washing, being rubbed on the surface of an electrical machine, contributed very much to the increase of electricity. The amalgam of tin is also prepared for this purpose.

*Amalgam of Zinc*, is prepared by a method similar to that employed in the former. It is much used in the arts, and is necessary to cover many other metals with zinc. Dr. Huggins

recommends this amalgam in preference to that of tin, for the purpose of exciting electricity, and increasing the power of the machine. It is now generally used with this design, by electricians.

No amalgam has yet been formed with cobalt, and it is supposed that this metallic substance is incapable of uniting with mercury. We are also ignorant of the manner in which mercury acts upon arsenic; no combination having been formed between them. But most of the other metals, if not all of them, may be amalgamated by one or other of the methods above described; and the difficulty, or ease of the operation, will be in proportion to the cohesion of the metal and the weakness of its affinity for mercury, or the contrary.

*AMALGAM*, in oryctology. See *HYDARGYRUM*.

*AMALGAMATION*, the act or practice of amalgamating metals, either for the purpose of extracting them from their ores, for purifying them, when extracted, or for applying them more readily to their different uses in the arts. In the last sense, the operation has been already treated of under the article *AMALGAM* in the two former, particularly the first, it is a part of metallurgy, and as such we are now to consider it.

The method of extracting the precious metals, as they are called, (i. e. gold and silver), from their ores, by means of amalgamation with mercury, has been known for many ages, it has been made use of from time immemorial in the streaming for gold, in order to purify and collect together the gold dust which is dispersed in the sands. This process was introduced into some of the mines of Mexico, in 1550, by don Pedro Fernandez de Velasco, and in 1571, into some of those of Peru by the same person, and from thence it quickly spread through all the mines in the south and north east parts of America, inasmuch that it is almost the only method used in that part of the world for extracting these metals. The richer ores, however, are purified by fusion with lead, and baron Born informs us that formerly the poorer kinds of ores were certainly thrown away, and when the method of amalgamation was introduced into Peru, the old harrows were searched for the ores which had been rejected as useless, but were now put to the quicksilver.

The following method of extracting gold from its ores is very much recommended. "The auriferous sand, which contains gold grains and gold dust, is concentrated by washing, and without any calcination goes to the above-mentioned washing-pit, which for this purpose need not be so large. On its upper part is fixed a square ladder, about twelve feet long, covered in the bottom with a woollen cloth, in order to retain any part of the gold dust which may be carried over with the water and stuff gently stirred in the pit. When the water carries off its more mud, but still clear, the further supply is to be stopped, the water in the pit is pumped, or taken out with buckets,



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the coarser sand in the bottom is separated or scraped off by hands, and the finer heaviest sand at the bottom is mixed with quicksilver. Then it is squeezed through a piece of cloth, the quicksilver comes off without any gold, which separated from the sand remains as an amalgam, and is pure after the remaining quicksilver has been evaporated. The sand and heavier dust remaining on the launder are washed and reated in the same manner.

"The auriferous ores and loadstones, however, which rise from different mines, are calcined like silver ores, more or less as the nature of their matrices will direct. Then they are ground and sifted, and the auriferous stuff, thus prepared, is put into heaps, exposed to the sunshine, and worked and turned about for three or four days. It requires no salt. Afterwards sulphur, and at last quicksilver, are added and mixed with it. There is no occasion for fire under the vessel in which it is triturated, except in winter, and two days after, though not dried, it is immediately carried to the washing pit, and treated like the amalgam of silver.

This method of extracting gold and silver is so certain and safe, that, when other methods of amalgamation extract only one ounce of gold and silver, this produces three or four from the poorest ores in a shorter space of time and with less expence.

There are three ways of employing amalgamation upon gold and silver ores, according to the method practised by Alonso Barba, viz in heaps or cixons,—in the boiler,—and in mortars.

1 *In heaps* Before the operation takes place in the large way, an essay is made of three or four pounds of the fine sifted powder taken from the general quantity, and according to the produce of this he calculates that of the whole. He tries it also with quicksilver, to know perfectly the method he is to follow, and the additions that are to be made. In this case the following method is adopted. 1 The matter is elixated, to extract the vitriol if there be any. 2 One pound of the lixiviated matter is tried with quicksilver and salt, carefully observing the colour and its change. If the quicksilver assumes the appearance of silver filings, and these quicksilver flakes become thinner and thinner it proves that the amalgamation goes on successfully, and that there is no occasion for any addition. The whole is stirred from time to time, till the quicksilver seems to diminish, and recover its natural form, but without dividing into small globules, after which the matter is to be washed, as all the silver is by that time completely taken up. The ores of Veraguena de Pacages are treated only with quicksilver and salt, and yet yield their full produce.

2 *Amalgamation by boiling*, was accidentally discovered by Barba, in an attempt to fix quicksilver.—On mixing silver ore finely powdered with quicksilver, and boiling it with water in a copper vessel, he found that the metals readily united, and thus having dis-

covered a shorter method of amalgamation, he gradually improved and introduced it into practice in Peru. In this operation the boilers must be of copper, earthen or other vessels being found not to answer; the copper also must be pure, because the quicksilver would dissolve the metals with which it is alloyed. They must be in the shape of inverted cones, and flat-bottomed. The under part has a rim of six or eight inches high and half an inch broad, all beat of one piece. Other copper plates are fixed in the inside with copper nails, and care must be taken that it be water-tight, that no quicksilver may run off, and for the better security, the inside of the boiler may be lined with lime and ox-blood. The boilers may be of any magnitude, their upper parts being surrounded with iron rings with strong handles, into which a cross board is wedged. In the middle of this board is a hole for the spindle to move in. The spindle is of light wood, and moves on a brass pivot in the bottom. It has four wooden wings, with three or four perpendicular bars, also of wood, the farthest from the spindle being the shortest, the nearest so long as to sweep the bottom. It is turned by a moveable handle on the upper end.

These boilers are put into an oblong furnace, capable of holding ten of them, the fire place being in the middle, and the flame and smoke passing under the boilers, and going out on both ends of the furnace by two chimneys. The fire being lighted, first the water, then the fine stuff, and at last the quicksilver, is put in, observing always that the bottom be fully covered with quicksilver. The water must always be kept boiling, otherwise the operation may be interrupted or become tedious on account of the evaporation, the boilers must be supplied with a quantity of water, in small quantities at a time, that the boiling be not checked. The stuff must be proportionate to the size of the boiler: if too little be put in, the amalgamation goes on too slowly, while too much would not allow the mass to be thick enough, or to boil with sufficient freedom. Some of the amalgam is to be taken out from time to time with a long ladle, and the progress of the operation is judged of by the colour. The assay of the matter determines whether all the silver be taken out of it in this manner. Some quicksilver is then thrown upon the surface of a sample of the boiled stuff, and worked round with it in a vessel two or three times. If the quicksilver rises and takes up some of the matter, some silver remains, if not, the whole is taken up. Then the fire is stopped, the spindle is taken out, and the water and matter let off. The coarser matter on the quicksilver may at all events be washed in cold water, and go twice more to the mill. Almost the whole of the silver amalgam lies upon the surface of the quicksilver, immediately under the stuff, sometimes four or five fingers thick; the fire under the boilers preventing the silver from uniting with the quicksilver in the bottom. This metal, when poured off, must be pressed and treated in the usual manner.

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The advantages attending this method are, 1. That the heat promotes the union of the metals, while the boiling and stirring brings them frequently into contact, so that much time is saved, and the whole process is finished in about twenty-four hours, 2. That less mercury is lost than by the common method, for being always covered with water it cannot evaporate, 3. That heaps in which, by too large additions, the mercury has been totally dissolved so as to disappear, may be easily cured by boiling them in iron or copper vessels with bits of iron, and then the mercury may be regained in its proper metallic form and brightness.

**3 Amalgamation in mortars** It is difficult to procure the full produce from ores which contain native gold and silver either in the form of lumps or wire, or in larger lumps and nodules. These cannot be completely pounded, nor can they be amalgamated, for the mercury will not dissolve the large particles of gold and silver, and when they are treated by fire, the stubborn nature of their matrices occasions a great loss of metal. The following method of treating them in a mortar was discovered by a Franciscan friar.

A round conical hole is cut in a hard stone, half a foot in diameter at top, of an equal depth, and sloping into a truncated, or rather obtuse and nearly flat bottom, of about four inches in diameter. Some quicksilver is poured into it, together with a proportional quantity of small bits of the native metal or ore, after which they are triturated with an iron pestle. By this violent trituration, the gold and silver combine with the quicksilver, and the finer, lighter matter of red silver ore and other silver calces, which are generally found with native silver, runs off by means of a small launder and current of water. It is not, however, suffered to run away, but is left to settle for common amalgamation.

Mortars of the dimensions above described being too small for any considerable quantity of ore, Barba proposes to substitute in their place larger stones of a concave figure, with vertical grinders, as in oil mills, or common horizontal and parallel grinders of the grist-mill. The ore and quicksilver are put between these stones, with a small stream of water, which, running off, will carry away the lighter stuff, whilst the gold and silver will remain at the bottom, taken up by the quicksilver.

When the amalgamation is completed, by whatever method, the gold or silver is separated from the mercury by pressing the amalgam through ramous leather, or through cloth, a part of the mercury is thus forced out, and the remainder may easily be disengaged by exposure to a proper degree of heat, which dissipates the mercury, while the gold or silver remains behind. When these processes take place in a vessel called a "great way," different machines are used to assist and expedite the operation.

The method of amalgamation is very generally used in Freiberg and Utenburg

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works, near Freiberg. Count Von Deust informs us, that by this method 79,785 cwt of ore, which, by the common mode, would have given only 31,139 lbs 4½ oz of silver, was made to yield 38,330 lbs 2½ ounces, thereby gaining 1190 lbs 7½ oz.

Gold and silver are the only metals that are extracted from their ores by amalgamation, the methods of obtaining the other metals will be found under their respective names. Under the names also of gold and silver, will be given an account of the other modes employed in separating these metals from their ores. The general principles of the process will be exhibited under the articles ASSAYING and SMELTING.

**AMALIA**, in entomology. A species of papilio, for the generic character of which, see PAPILIO.

**AMALTHEA**, daughter of Melissus king of Crete, fed Jupiter with goat's milk. Hence some authors have called her a goat, and have maintained that Jupiter, to reward her kindnesses, placed her in heaven as a constellation, and gave one of her horns to the nymphs who had taken care of his infant years. This horn was called the horn of plenty, and had the power to give the nymphs whatever they desired.

**AMALTHÆA**, the name of the Cumæan Sibyl, who offered to Tarquinius Superbus nine books, containing the Roman destinies, and demanded 300 pieces of gold for them. He denied her, whereupon she threw three of them into the fire, and returning, asked the same price for the other six, which being denied, she burnt three more, and returned, still demanding the same price. Upon which, Tarquin consulting the pontiffs, was advised to buy them. These books were in such esteem, that two magistrates were created to consult them upon extraordinary occasions.

**AMAMA** (Sixtinus), professor of the Hebrew tongue in the university of Prague, a man of great learning, was born in Finland, and had studied under Drusus. He published a criticism upon the translation of the Pentateuch, collated the Dutch translation of the Bible with the original and the most accurate translations, and wrote a censure of the Vulgate translation of the historical books of the Old Testament, Job, the Psalms, and Canticles. It is impossible to answer the reasons which he shews the necessity of consulting the originals. This he recommended to the synods, that some synods, being influenced by his reasons, decreed, that none should be admitted into the ministry but such as had a competent knowledge of the Hebrew and Greek text of the Scripture. He died in 1629.

**AMAN**, a sort of blue cotton cloth, which comes from the Levant by the way of Aleppo.

**AMANA**, one of the Bahama Islands.

**AMANE** (St.) a town of France, in the department of Cher, and late territory of Bourboulon. Lat 46° 45' N. Long 2° 30' E.

**AMAND** (St.) a town of France, in the



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department of the North, and late French  
 Flanders Lat. 50 27 N Lon 3 35 E

**AMARA DULCIS** See **DULCAMARA**

**AMARANTE**, an order of knighthood, instituted in Sweden by queen Christina, in 1653, at an annual feast, at the close of which she threw off her habit, which was covered with diamonds, leaving it to be pulled in pieces by the masques In memory of this ridiculous scramble she founded a military order called in Swedish Ceschuschaft, into which all present at the feast were admitted, including sixteen lords and as many ladies, besides the queen Their device was the cypher of Amaranthe, composed of two A's, the one erect, the other inverted, and interwoven together, the whole inclosed by a laurel crown, with this motto, *Dolce nella memoria*

**AMARANTH** (Globe) See **GOMPHRENA**

**AMARANTHINE**. *a* 1. Consisting of amaranthus 2. Unfading, never decaying

**AMARANTHOIDES**. See **CALOSIA**, and **ILLECEBRUM**

**AMARANTHUS** Amaranth, or flower-gentle A genus of the class and order monoecia pentandria, thus characterised Male, calyx three-leaved; corollous, stamens three or five Female, calyx three-leaved, corollous, styles three, capsule one seeded, opening horizontally all round, seed one. It comprises twenty-eight species; some of which are common to Europe, others to Asia, and others to America Our own wild Amaranth is the *abritum* The *hypocondriacus* is prince's-feather, a native of Virginia, and the *caudatus*, love-lies-bleeding, of Indian origin

The *oleaceus*, esculent amarantus, as well as several other Indian species, is eaten, in the east, in the same manner as cabbages among ourselves

**AMARDUS**, in ancient geography, a river of Media, which discharged itself into the Caspian sea

**AMARITUDE** *a* (*amritudo*, Lat) Bitterness (Harvey)

**AMARUM** In oenology, a genus of the class salts of a bitter taste, easily soluble in water, the solution becoming milky by a mixture of soda, easily melting in heat, but neither detonating nor decrepitating Six species 1 A genium Epsom salt Sulphat of magnesia Magnesia vitriolata (See **MAGNÉSIA VITRIOLATA**) 2 A muraticum Found plentifully in salt waters, springs, and lakes 3 A calcareum Found in the ocean and other saline waters, and sometimes in a dry state 4 A nitrosum Nitrated salt Found mixed with soil and on old walls 5 A animale Found generally with nitrous humosum 6 A animale Found with nitrous humosum, and composed of phosphoric acid and nitre

**AMARUM**, In oenology, a genus of the class earths, order siliceous, consisting of silica, a smaller proportion of magnesia, a very small quantity of alumina, and carbonat of lime, and a small part of dry clay, more or less hard, tenacious,

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subopaque, a little greasy, green, of a splintery texture, breaking into indeterminate fragments, of a common form not fusible per se One species only *A amazonicus* Found in the East, New Zealand, Helvetia, and Lapland mountains, and often fashioned in the East, and New Zealand, into various ornaments, vessels, and urns

**AMARYLLIS** Lilly-daffodil A genus of the class and order hexandria monogynia Its corol six petalled, form irregular, filament, inserted in the throat of the tube, declined, unequal in proportion or direction (See *Nat Hist pl V*) There are thirty-seven species, some with a one-flowered, others with a two-flowered, and others, again, with a many-flowered spathe Each of the four quarters constitutes several of these species, but the greater number are Cap plants The corols of all are exquisitely beautiful, but the *A lutea*, from the south of Europe, is the only one that will flourish in this country, out of our green-houses

**AMASIA**, in entomology, a species of *Papilio*, in the nymphal section See **PAPILIO**

**AMASMENT** *s* (from *amas*) A heap; an accumulation, a collection (*Glanville*)

**AMASONIA** In botany, a genus of the class and order didynamia, angiospermia Its calyx is five-cleft, corol tubular, with a small five-cleft border, berry four-seeded. There are only two known species, the *a erecta* from Surinam, and the *a punicea* from Trinity island

To **AMASS** *v a* (*amasser*, Fr.) 1. To collect together into one heap or mass (*Alfar*). 2 To add one thing to another (*Pope*)

**AMASS** *s* (*amas*, Fr) An assemblage; an accumulation (*Wotton*)

To **AMATE** *v a* (from *a* and *mate*.) To accompany; to entertain as a companion (*Spenser*)

**AMATEUR**, in the arts, is a foreign term introduced, and now current amongst us, to denote a person understanding, and loving or practising, the polite arts of painting, sculpture, or architecture, without any regard to pecuniary advantage

**AMATEUR**, in music, is, in French, equivalent to the Italian term *Dilettante*, implying a lover and cultivator of music, not professionally, but for his amusement.

**AMATORII** (*Amatorii*, or *musculi*) A term given to the muscles of the eye by which that organ is moved when gazing

**AMATORIUS**, in ornithology, the amorous titmouse, or parus amarus

**AMATORY** *a*. (*amatorius*, Lat.) Relating to love, causing love (*Branshall*)

**AMAUROSIS**. (*Amaurosis*, *s*, *f*, from *amauro*, to darken; *Gr* *auros*, light) Amblyopia A total loss of sight without any visible injury to the eye, the pupil usually dilated and immovable A genus of disease in the eye, local, and order system of the eye It arises generally from compression of the optic nerve, amaurosis compressiva, from debility, amaurosis atonica, from spasm, ama-

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rossi spasmodica, or from poisons, amaurosis venenata

**AMAUSA**, pastes made of lead and crystal with various admixtures for imitating gems

**AMAXOBII**, a people who, according to Ptolemy, inhabited the interior parts of Scythia, in Europe

**To AMAZE** *v a* (from *a* and *maze*, perplexity) 1 To confuse with terror (*I zekiel*) 2 To put into confusion with wonder (*Smith*) 3 To put into perplexity (*Shakespeare*)

**AMAZE** *s* (from the verb) Astonishment confusion either of fear or wonder (*Milton*)

**AMAZEDLY** *ad* (from *amaze*) Confusedly with amazement (*Shakespeare*)

**AMAZINDNESS** *s* (from *amaze*) The state of being amazed, astonishment, wonder, confusion (*Shakespeare*)

**AMAZEMENT** *s* (from *amaze*) 1 Confused apprehension, extreme fear, horror (*Shakespeare*) 2 Extreme dejection (*Milton*) 3 Hight of admiration (*Waller*) 4 Astonishment, wonder at an unexpected event (*Acts*)

**AMAZING** *particip a* (from *amaze*) Wonderful, astonishing (*Addison*)

**AMAZINGLY** *ad* (from *amazing*) To a degree that may excite astonishment (*Waller*)

**AMAZONIA**, a country of South America, bounded on the north by Terra Firma and Guiana, on the east by the Atlantic Ocean and Brazil, on the south by La Plata, and on the west by Peru, 400 leagues in length, and 320 in breadth, inhabited by numerous Indian nations

**AMAZONIAN** *a* Something relating to, or resembling Amazons

**AMAZONS**, in antiquity, a nation of fierce warriors, who founded an empire in Asia Minor, upon the river Thermodoon, along the coasts of the Black Sea. They are said to have formed a state out of which men were excluded. What commerce they had with that sex, was only with strangers, they killed all their male children, and cut off the right breast of their females, to make them more fit for the combat. From which last circumstance it is, that they are supposed to take their name, viz from the privative *a*, and *μαστος*, *mastos*, "breast"

M. Petit, a French physician, published a Latin dissertation in 1685, to prove that there was really a nation of Amazons, it contains abundance of curious inquiries, relating to their habits, their arms, the cities built by them, &c. Others of the moderns also maintain, that their existence is sufficiently proved by the testimony of such of the historians of antiquity as are most worthy of credit, by the monuments which many of them have mentioned, and by medals, some of which are still remaining, and that there is not the least room to believe that what is said of them is fabulous. It has indeed been controverted, even among the ancients, whether ever there really were such a nation as that of the Amazons. Strabo, Ptolemy, and others, deny it. On the contrary, Herodotus, Demetrius, Diodorus Siculus, Trajan Pomponius, Lucan, Pliny, Mela, Plutarch,

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&c expressly assert it. The question is not of sufficient consequence to need discussion here

**AMAZONS** (the river of), called by the Spaniards Marañon, is the greatest river in the world. It received the name of Amazons, because the Spaniards who first passed through the country on its banks, having some smart skirmishes with the natives, and afterwards examining the slain, found the bodies of some women among them. Orellana was the first who discovered this river, about the year 1539. The Marañon, after issuing from the lake from whence it takes its rise, in about eleven degrees of south latitude, runs towards the north to Jaen de Bracamoros, for the length of six degrees, from whence it directs its course towards the east, almost parallel to the equinoctial line, as far as the north cape, where it discharges itself into the ocean directly under the equator, by a mouth 50 or 60 leagues broad. It runs from Jaen, where it begins to be navigable, thirty degrees of longitude, according to Condamin who was sent into these parts by the French king to discover the true measure of the earth. This is equal to 1800 miles of 60 to a degree. But if the turnings and windings are reckoned, it will then be at least 2700 miles. It receives from the north and south a prodigious number of rivers, some of which run 1000 miles, and are not inferior to the Danube or Nile. The country through which this river runs is very little known to the Europeans

**AMBA**, an Abyssinian or Ethiopic word, signifying a rock. As *amba dorho*, the rock of a hen, &c

**AMBA** (*CHI*), in topography, denotes a hill or mountain or territory, the possession of which has the administration of justice, both in alto and basso

**AMBA**'GES *s* (Lat) A circuit of words, a multiplicity of words (*Locke*)

**AMBA**GIOUS *a* (from *ambages*) Circumlocutory, perplexed, tedious

**AMBARVALIA**, processions round the ploughed fields, in honour of Ceres the goddess of corn, celebrated by the Romans, one about the month of April, the other in July. They went three times round their fields crowned with oak leaves, singing hymns to Ceres, and entreating her to preserve their corn. The word is derived ab *ambiendis arvis*, i. e. going round the fields. A sow, a sheep, and a bull, called *ambarvalia hostia*, were afterwards immolated, and the sacrifice has sometimes been called *suaveturilia*, from *sus*, or *is*, and *taurus*

**AMBASSADOR**, or **AMBASSADOR**, one who is sent in a public character from one sovereign to another. The word is derived from the low Latin, *ambasciator*. Ambassadors are either ordinary or extraordinary

**AMBASSADOR ORDINARY**, is one residing at another court for keeping up a good intelligence between the two powers, taking care of the interest of his master, and negotiating such affairs as may occasionally happen.

**AMBASSADOR EXTRAORDINARY**, is a person sent to the court of a foreign power, on

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some particular emergent and pressing affair, as to conclude a peace, or a marriage, make a compliment, &c. There is no essential difference between ambassadors ordinary and extraordinary, the motive of their embassies also is distinguished them: they are equally entitled to the privileges given to ambassadors by the law of nations. Till within these two centuries, all ambassadors were extraordinary, and retired as soon as they had finished the affair they were sent to negotiate.

The name of ambassador, says Cicero, is sacred and inviolable. And this has always been the opinion of all nations, for we find that David thought the affront offered to his ambassadors, a sufficient reason for making war against the Ammonites, and Alexander put the inhabitants of Tyre to the sword for insulting his ambassadors. It must be observed, though, that ambassadors cannot be defended when they commit any thing against that state, or the person of the prince, with whom they reside, and if they are guilty of treason, felony, &c. or any other crime against the law of nations, they lose the privilege of an ambassador, and may be subject to punishment as private persons.

AMBASSADRESS (*ambassadrice*, Fr.)  
1 The lady of an ambassador. 2 A woman personifying a messenger (*Rome*).

AMBASSAGE (*from ambassadeur*) An embassy (*Bacon*).

AMBER (*from the Arabic amir, princely, noble, from its beautiful colour*) *ΑΜΒΕΡ*, Gr *Succinum*, Lat *Ambre jaune*, Fr a bituminous substance, of which there are several varieties distinguished by their colour, contexture, transparency, or opacity. The colour of amber is generally some shade of red or yellow, and is always found in detached pieces. Its consistency is nearly equal to certain stones, and its fracture is conchoidal. It is commonly transparent, and when rubbed becomes capable of attracting straws, hairs, and other light substances, whence, in allusion to its Greek name, the word electricity is derived. It is often found to contain insects and leaves in high preservation, which proves that it has been in a liquid state, and in that state has enclosed those bodies. When applied to a lighted candle, it takes fire, swells, and exhibits a pungent white smoke. It is distinguished from copal and honey-stone, with which it is sometimes confounded, by being harder than the former, and not melting, like it, into drops, when inflamed, and by having stronger electrical properties than the latter, from which it also differs in not becoming white when laid upon a hot coal. The specific gravity of amber varies from 1.065 to 1.1.

The only proper mines of this substance that are as yet known, are in Ducal Prussia, near the sea-coast, in which the amber is found imbedded in a stratum of fossil or carbonated wood. The mines are worked in the usual way, by shafts and galleries, to the depth of a hundred feet. Amber is also found along the whole shore of the German sea, and on the

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south coast of the Baltic. The projecting eastern shore of England and the coast at the entrance of the Channel from the north, affords many specimens. It is frequently thrown on the shores of Yorkshire, and fine specimens have been found in the clay-pits between Ely, Linn and Kensington gravel pits, and that behind St George's Hospital at Hyde park corner.

Formerly, amber was in much request as an ornament, and its value on this account, induced many attempts to be made for the purpose of increasing its beauty. There are two methods which have been generally employed, to render opaque amber transparent: first, by surrounding it with sand in an iron pot, and cementing it with a gentle heat for about forty hours, and, secondly, which was the most usual method, by digesting and boiling the amber about twenty hours with rapeseed oil, which renders it both harder and clearer. The value of amber depending upon its size, numerous unsuccessful attempts have been made to solder together, or melt down, several small pieces so as to convert them into one large piece. Fourcroy, however, asserts that two pieces of this substance may be joined together, by dipping them in a solution of potash, heating them, and applying them to each other. Though the use of amber, as an ornament, is superseded among us by the introduction of diamonds and cut stones, it is much used for this purpose in Turkey, and the East, where it is still highly valued. Wallerius says, that the most transparent pieces may be used for microscopes, burning glasses, prisms, &c. and it has been said that the late king of Prussia had an amber burning glass one foot in diameter.

The chemical properties of amber have been hitherto but little examined. Few menstrua will dissolve it without in some degree altering its nature. When exposed to dry distillation in a glass retort, it melts and swells greatly, and gives out at first a watery acid liquor smelling strongly of amber, then a concrete acid salt which crystallizes in yellowish needles in the neck of the retort. This is the acid of amber or the succinic acid, as it is now termed, under which latter article its chief properties are pointed out. After the acid there passes a light-coloured odorant oil, called the oil of amber, which, as the distillation goes on, becomes of a darker colour and thicker consistence, a small quantity of the acid also rises at the same time. When all the volatile parts are thus separated there remains in the retort a spongy shining coal, intensely black, which is the basis of the fine black varnish so much used in the arts. The oil is afterwards rectified by distillation with water, when only the light, fragrant, colourless part comes over. This oil, combined with ammonia, forms Eau de Luce, which is prepared by pouring a few drops of oil of amber into a phial full of caustic ammoniac, and shaking the mixture till it assumes a milk-white colour. The use of this compound as a stimulant and restorative in

fainting fits, is well known. The oil of amber will also dissolve sulphur by the heat of a sand-bath, thus composing a medicine called succinated balsam of sulphur. See BALSAM.

The oil, as well as other preparations of amber, are much used in medicine against spasmodic diseases. For the test, see SUCCINUM.

AMBER, ACID OF. See SUCCINIC ACID.

AMBER, BLACK. Gazates. See JET.

AMBER OF SOPOR. See ASPHALTUS.

AMBER TREE. See ANTHROSPERMUM.

AMBERBOI. See CENTAUREA.

AMBERG, the capital of the Upper Palatinate of Bavaria, in Germany, defended by a strong castle. Lat 49° 30' N. Lon 12° 7' E.

AMBERGRIS, AMBERGREASE, or GREY AMBER, AMBRA, an inflammable substance, of doubtful origin. Its colour is grey, brown, or yellowish brown, spotted with black, its hardness and consistence are those of wax, its specific gravity from 780 to 920 so that it swims both in water and alcohol, its fracture is earthy and rugged, and exhibits bones of fish or beaks of birds, it has scarcely any particular taste, and unless heated, or much handled, very little smell, but in such circumstances its odour is very fragrant, resembling that of burning amber, and to most persons agreeable. It softens between the fingers, melts in a small degree of heat like wax, inflames in a stronger heat, and if pure leaves no residuum, cold water has no effect upon it, but to boiling water it communicates its smell, and being partially melted, falls to pieces. It is scarcely affected by spirit of wine, or fat oils, the former dissolves it with the assistance of heat, if the quantity of spirit be twelve times that of the ambergris, by the essential oils, as that of turpentine, it is dissolved almost entirely, and by ether most perfectly. It has been found soluble in caustic fixed alkalis, still more so in sulphuric acid, and precipitable by water. When distilled, it yields an aqueous phlegm, a brown-coloured acidulous spirit, a deeper-coloured oil, a thick balsam, and, as some say, a volatile salt, leaving a black shining residuum. The spirit, oil, balsam, and salt, are similar to those obtained from amber, but the oil is of a more grateful smell. Its chemical products resemble those of bitumens, among which it has been ranked.

Ambregis, in a medical view, is stomachic, cordial, and antispasmodic. It is used in doses of several grains, in certain drunks, or mixed in other substances. The odoriferous principle of this medicine is often too active, too penetrating, and liable to do harm. It is well known that many persons cannot bear the smell of it, without feeling their nerves very disagreeably affected. It should therefore be administered very cautiously. It enters into the composition of many cathartic, sudorific, and emmenagogue waters, but its virtues consist chiefly in its antispasmodic and sedative qualities, and its power of relieving certain hysterical, convulsive, and other nervous affections.

In Asia, and part of Africa, ambregis is

used not only as a perfume and a medicine, but as an article of cookery; in which it is added to dishes in lieu of all-spice. A great quantity of it is bought by the Mecca pilgrims, probably to use it for the purpose of fumigation and sacrifice, as the catholics use frankincense. With us its use is chiefly confined to perfumers, who melt it over a gentle fire, and make extracts, essences, and tinctures of it, they also use it to scent pillows, candles, balls, bottles, gloves, and hair-powder.

As ambregis is very dear, it is counterfeited and mixed with different substances. It may be known to be genuine by its fragrant scent, when a hot needle or pin is thrust into it, and its melting like fat, of a uniform consistence, it swims also on water, when pure, and does not stick to hot iron. The counterfeit will not yield such a smell, nor prove of such a fat texture.

It is remarkable that this substance, which is the most sweet of all the perfumes, should be capable of being imitated in smell, by the preparation of one of the most odious of all fetid substances. M. Homberg found that a vessel in which he had made a long digestion of the human faeces, acquired a very strong and perfect smell of ambregis, inasmuch that any one would have thought a great quantity of essence of ambregis had been made in it. The perfume was so strong and offensive, that the vessel was forced to be removed out of the laboratory.

Respecting the origin of ambregis, the opinions of philosophers have long been divided. By many it has been considered as a bitumen, a sort of petroleum issuing from the rocks, and condensed by the action of the sun and the water of the sea. Others have imagined it to be made up of the excrements of birds nourished on odoriferous herbs, and by some it has been taken for a sea mushroom, torn up from the bottom by the violence of tempests. Others, again, have ascribed its origin to the froth thrown out by sea calves, the excrements of the crocodile, &c. Pomet and Lemery thought it a mixture of wax and honey, hardened by the action of the sun, and altered by the sea water. M. Formey, who has adopted this opinion, supports it by an experiment which consists in digesting wax and honey. He asserts, that a product may thus be formed, of an agreeable smell, nearly the same with that of ambregis. Some authors have considered ambregis as an animal juice, deposited in bags situated near the root of the genital organ in the male whale, and others have imagined that it is formed in the bladder of that cetaceous animal, but the ribs of cuttle-fishes found in this concrete juice, are sufficient to confute these opinions. The most probable opinion, and which has of late obtained the most general admission, is that of Dr. Schweddaur, who, after examining a great many specimens of this substance, and receiving accounts concerning it from different navigators, has concluded it to be formed in the alimentary canal of the physeter macrocephalus.

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ee spermaceti whale He considers ambergris as an excrement of this cetaceous animal, mixed with some parts of its food 1 Because fishermen find it in these whales, 2 Because it is common in the latitudes which they inhabit, 3 Because beaks of the cuttle-fish with eight feet, sepia octopoda, on which that animal lives, are always found in it, 4 Because he distinguished the black spots mixed through ambergris to be the nebs of this polypous animal, Lastly, because the excrements of several quadrupeds, as cows, hogs, &c exhale an odour similar to that of ambergris, when kept for any length of time This opinion of Dr Schwediaur respecting the origin of ambergris, though not exclusively his own, has derived considerable probability from his researches, and has likewise received confirmation from those of Alexander Champion, esq a principal merchant concerned in the southern whale-fishery, and of the captain of a ship, employed by him, in the said fishery See AMBIA

AMBIENT *a* (*ambiens*, Lat.) Surrounding, encompassing, investing (*Newton*)

AMBIDEXTER *s* (*Latin*) 1 A man who has equally the use of both his hands (*Brown*) 2 A man who is equally ready to act on either side, in party disputes

AMBIDEXTERITY *s* (from *ambidexter*) 1 The quality of being able equally to use both hands 2 Double dealing

AMBIDEXTROUS *a* (from *ambidexter*, Latin) 1 Having, with equal facility, the use of either hand (*Brown*) 2 Double dealing, practising on both sides (*L'Estrange*)

AMBIDEXTROUSNESS *s* (from *ambidextro*) The quality of being ambidextrous

AMBIGENÆ OVES, in the heathen sacrifices, an appellation given to such ewes as, having brought forth twins, were sacrificed with their two lambs, one on each side

AMBIGENAL HYPERBOLEA, a name given by sir Isaac Newton, in his *Enumeratio Linearum Tertii Ordinis*, to one of the triple hyperbolas of the second order, having one of its infinite legs falling within an angle formed by the asymptotes, and the other without that angle

AMBIGU *s* (*French*) An entertainment consisting of a medley of dishes (*King*)

AMBIGUITY *s* (from *ambiguus*) Doubtfulness of meaning, uncertainty of signification; double meaning (*South*)

AMBIGUOUS *a* (*ambiguus*, Latin) 1 Doubtful, having two meanings (*Clarendon*) 2 Using doubtful expressions (*Dryden*)

AMBIGUOUSLY *ad* (from *ambiguus*) In an ambiguous manner, doubtfully

AMBIGUOUSNESS *s* (from *ambiguus*) Uncertainty of meaning, duplicity of signification

AMBILOQUOUS *a* (from *ambo* and *loquor*, Lat.) Using ambiguous expressions

AMBILOQUY *s*, (*ambiloquium*, Lat.) Discourse of doubtful meaning

AMBIT, the compass, circuit, or perimeter of any thing.

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AMBIT, *ambitus*, was particularly used, in antiquity, to denote a space of ground to be left vacant betwixt one building and another By the laws of the Twelve Tables, houses were not to be built contiguous, but an ambit, or space of two feet and a half, was to be left about each, for fear of fire

AMBITION, in ethics, is the passion which prompts men to value or to seek any kind of eminence or distinction, as well as to avoid degradation and reproach It is a kind of compound of admiration and desire, and becomes either a virtue or a vice, honourable or disgraceful, useful or pernicious, according to its direction or degree The opinions of others concerning us, when expressed by words or actions, are principal sources of happiness or misery The pleasures of this kind are usually referred to the head of honour, the pains to that of shame, but as it is most convenient to have a single word, to which to refer both pleasure and pain of this class, Dr Hartley selects ambition for this purpose He divides the several particulars which persons, under the influence of ambition, wish to have known to others, or concealed from them, in order to obtain praise or dispraise, under four heads, viz external advantages or disadvantages, of which the principal are fine clothes, riches, titles, and high birth, with their opposites, rags, poverty, obscurity, and low birth, bodily perfections and imperfections, of which the chief are beauty, strength, and health on the one hand, and on the other, deformity, imbecility unfitting a person for the offices of life, and disease, intellectual accomplishments or defects, such as sagacity, memory, invention, wit, learning, and their opposites, folly, dullness, and ignorance, and moral qualities, i.e. virtue or vice This ingenious writer investigates, in conformity to his proposed theory, the associations by which the pleasures and pains of ambition are produced Observations on Man, § 2 prop 95 p 443 vol 1 edit. 1801

AMBITIOUS *a* (*ambitiosus*, Lat.) Seized or touched with ambition, desirous of advancement, aspiring (*Arbutnot*)

AMBITIOUSLY *ad* (from *ambitiosus*) With eagerness of advancement or preference (*Dryden*)

AMBITIOUSNESS *s*. The quality of being ambitious

AMBITUDE *s* (*ambio*, Lat.) Compass, circuit, circumference

AMBITUS, in Roman antiquity, the setting up for some magistracy or office, and formally going round the city to solicit the interest and votes of the people Ambitus differed from ambition, as the former lies in the act, the latter in the mind Ambitus was of two kinds, one lawful, the other infamous The first, called also ambitus popularis, was when a person offered his service to the republic frankly, leaving it to every body to judge of his pretensions as they found reasonable The second kind was that wherein force, cajoling, money, or other improper influence was made use of, which was severely punished

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**AMSTUS**, in music, is sometimes, though seldom, used to signify the particular extent of each tone, as to gravity or acuteness.

To **AMBLE** *v a* (*ambler*, Fr *ambulo*, Lat.) 1 In horsemanship, to move upon an amble, to pace. 2 To move easily (*Shaks*) 3 To move with submission (*Rowe*) 4 To walk daintily and affectedly (*Shaks*)

**AMBLE**, in the manège, a peculiar kind of pace, in which a horse's two legs of the same side move at the same time.

**A'MBIER** *s* (from *to amble*) A pacer.

**AMBLINGLY** *ad* (from *ambling*) With an ambling movement.

**AMBLESIDE**, a town of Westmoreland, having a market on Wednesday Lat 54 28 N Lon 3 6 W.

**AMBLETEUSE**, a sea-port town of France, in the English channel, in the department of the Straits of Calais one league and a half N Boulogne. At this port, then called Ambletonensis Portus, Cæsar embarked his cavalry when he passed over to England.

**AMBLO-SIS** (*amblōsis*, from *αμβλω*, to misc abortion) A miscarriage. In Cullen, a species of the genus *menorrhagia*.

**AMBLO-TICA** (*amblo-tica*, sc *medicamenta*, *αμβλοτικά*, from *αμβλω*, to misc abortion) Medicines which were supposed to occasion abortion.

**AMBLYGON**, **AMBLYGONAL**, in geometry, obtuse-angled.

**AMBLYOPIA** (*amblyopia*, from *αμβλυ*, dull, and *οπ*, an eye) A debility or dullness of sight. An incipient amaurosis.

**AMBO**, or **AMBON**, a kind of pulpit or desk, in the ancient churches, where the priests and deacons stood to read or sing part of the service, and preach to the people, called also *Analogium*. The term is derived from *αμβων*, to mount. The ambo was mounted upon two sides, whence some also derive the appellation from the Latin *ambo*, both. Besides the gospel, which was read at the top of the ambo, and the psalter, which was read a step lower, they likewise published from this place the acts of the martyrs, the commemoration of departed saints, and the letters of peace and communion sent by one church to another.

**AMBOES**, in geography, a people of Lower Guinea, in Africa.

**AMBOYNA**, one of the Molucca Islands in the East Indies. It is the chief of the Spice Islands, and remarkable for the quantity of cloves and nutmeg it produces. The inhabitants of Amboyna are computed at about 20000. Lat 4 05 Lon 127 0 E.

**AMBR**, in oryctology. *Ambrus*. A genus of the class infirmionibus, of which there is but one species, though this species admits of several varieties. We have already described it under the article *AMAKROKIS*, which see.

**AMBRASIA**, in ancient geography, was one of the most considerable cities of Epirus, and situated in the territory of the Ambracians near the mouth of the river Arctyrus, and the gulf to which it gave its name. It is now reduced to

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a small place of Turkey in Europe called Ambrachia, on the lower part of the gulf of Lata in the southern Albania.

**AMBRUADÆ**, the fictitious amber which the Europeans use in trading with the negroes on the African coast.

**AMBRESBURY**, a town in Wiltshire, with a market on Friday. It is six miles N of Salisbury Lat 51 11 N Lon 1 40 W. Not far from hence is that celebrated monument of antiquity, Stonehenge.

**AMBRONES**, in ancient geography, a people of Gaul, who had possession to the north and south of the Po. See Plutarch in Marco.

**AMBROSE** (St), bishop of Milan, was

born in Gaul, about 340. His father was præfect of Gaul, and gave his son an excellent education. His eloquence as a pleader procured for him the governorship of Liguria and Æmilia, on which account he settled at Milan. On the death of Auxentius, bishop of Milan, in 374, a contest arose between the Arians and Catholics, about electing a successor. The tumult in the church was so great, that Ambrose found it necessary to go thither to restore peace.

While he was speaking to the people, a child cried out, "Ambrose is bishop." This seeming to be the direction of heaven, the people were determined to act upon it, and all the endeavours of the governor proved fruitless to get them to elect another person. He was accordingly baptized, being only a catechumen before, and then consecrated. In 383, he was sent by the emperor Valentinian to the tyrant Maximus, and prevailed upon him not to enter Italy. About the same time the heathens endeavoured to restore their religion, for which purpose they employed Symmachus præfect of Rome, to plead their cause, in which he was baffled by Ambrose, who also experienced some trouble from the Arians. The empress Justina was of that sect, and demanded of him the Portian church at Milan for the Arians, which he stoutly refused. He was sent again to Maximus, but notwithstanding his eloquence, the tyrant entered Italy, and made himself master of the western empire, and entered Milan in triumph. Valentinian and his family sought refuge with Theodosius, who in his turn defeated Maximus, and restored the fugitive monarch to his throne. While Theodosius staid in Italy, an insurrection happened in Thessalonica, in which the emperor's lieutenant was slain. Theodosius, to revenge this riot, put to death a vast number of persons in cool blood. Soon after this massacre he came to Milan, and was about to enter the great church, when he was met at the door by Ambrose, who refused him admittance as a homicide. Theodosius returned to his palace in great distress of mind, and it was not till a year afterwards, and his shewing tokens of repentance, that the prelate would admit him to christian communion. Ambrose died at Milan, in 397, and was buried in the great church of that city. His writings were published in two vols. folio, at Paris, in 1680 and 1690. The



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composed the noble hymn, "Te Deum Laudamus" (*Wilkins*)

**AMBROSE** (Isaac), an eminent presbyterian minister, was educated at Brazen-nose college, Oxford, where he took the degree of bachelor of arts, and became minister of Preston, and afterwards of Crastang, in Lancashire, where he was in 1662 ejected for non conformity. It was usual with him to retire every year for a month into a little hut in a wood; where he shunned all society, and devoted himself to religious contemplation. Dr. Clancy observes, that he had a very strong impulse on his mind of the approach of death, and took a formal leave of his friends at his house, a little before his departure, and the last night of his life he sent his discourse concerning angels to the press. The next day he shut himself up in his parlour to the great surprise and regret of all who saw him, he was found just expiring. He died in 1663-4, in the seventy-second year of his age. He wrote several other books, as the *Prima, Media, and Ultima*, or the *First, Middle, and Last Things*, *War with Devils*, *Looking upon Jesus*, &c.

**AMBROSE**, or **ST AMBROSE** IN THE WOOD, an order of religious, who use the Ambrosian office, and wear an image of that saint engraven on a little plate in other respects, they conform to the rule of the Augustins.

**AMBROSE ISLAND**, an island on the coast of Chili, 15 miles W from St Felix Island. The crew of captain Roberts in 1792, killed and cured here 13,000 seal skins in seven weeks. It is 26 13 S. 1 on 80 55 W.

**AMBROSIA** (from  $\alpha$  and  $\beta\rho\sigma\iota\varsigma$ , *immortal*) In heathen antiquity denotes the solid food of the gods, in contradistinction from their drink, which was called *nectar*.

**AMBROSIA** is also a pompous kind of title, given by the old physicians to certain alexipharmic compositions. A famous antidote of Philip of Macedon, against all poisons, bites, and stings of venomous creatures, was also called by this name.

**AMBROSIA** In botany a genus of the class and order monœcia, pentandria. Male —calyx common, one leaved; florets one-petalled, funnel-form, three cleft, receptacle naked. Female —calyx one leaved one-flowered, corolless, nut one-seeded, crowned with the five teeth of the hardened calyx. There are five species, chiefly natives of North America.

**AMBROSIAL** *a* (from *ambrosia*) Partaking of the nature or qualities of ambrosia, fragrant, delicious, delectable (*Pope*).

**AMBROSINIA** In botany a genus of the class and order monœcia polyandria. Spathe one-leaved, separated by a membranaceous partition, containing the stamens in the hinder cell and upper part of the partition; pistils in the outer cell and lower part of the partition. The only known species is a Sicilian plant with a tuberose root.

**AMBRY** *s* (corrupted from *almonry*) 1 The place where alms are distributed. 2 The place where plate, and utensils for housekeeping, are kept.

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**AMBS ACF** *s* (from *ambo*, Lat and *ace*) A double ace (*Bramhall*)

**AMBUBAJE**, in Roman antiquity immodest Syrian women, who came to Rome, and lived chiefly upon prostitution, and selling paint for the face.

**AMBUBLIA**, in botany, a name given, by some authors, to wild succory.

**AMBULATIO** *s* (*ambulatio*, Lat) The act of walking (*Brown*)

**AMBULATORY** *a* (*ambulo*, Latin) 1 That which has the power or faculty of walking (*Wilkins*) 2 That which happens during a passage or walk (*Wotton*) 3 Moveable, shifting place 4 This word is applied to the feet of birds, when the toes are placed three behind and one before.

**AMBURBIUM** or **AMBURBIAL SACRUM**, in antiquity, a religious feast, or ceremony, practised among the Romans wherein they made processions around their city, in order to avert some calamity.

**AMBURY**, among farmers, a name given to a tumour, wart, or swelling on the body of a horse, soft to the touch, and full of blood. This is cured by tying a horse-hair very tightly about its root, which causes the whole to rot and fall off, then verdigrease is strewn upon the part to prevent a return of the complaint. If the tumour be very small, it is best to reduce it by means of caustics.

**AMBUSCADE** *s* (*embuscade*, Fr) A private station in which men lie to surprise others, ambush (*Addison*)

**AMBUSCADO** *s* (*embuscada*, Span) A private post in order to surprise (*Shaks*)

**AMBUSH** *s* (*embusche*, Fr) 1 The post where soldiers or assassins are placed, in order to fall unexpectedly upon an enemy (*Dryden*) 2 The act of surprising another, by lying in wait (*Milton*) 3 The state of lying in wait (*Hayward*) 4 The persons placed in private stations (*Shaks*)

**AMBUSHED** *a* (from *ambush*) Placed in ambush, lying in wait (*Dryden*).

**AMBUSHMENT** *s* (from *ambush*) Ambush, surprise, not used (*Spenser*)

**AMBUSUS** *a* (*ambustus*, Lat) Burnt, scalded.

**AMBUSULA** a term used in surgery for a solution of continuity, caused by the application of heated substances.

**AMBUSTION** *s* (*ambustio*, Lat) A burn, a scald.

**AMF**, a musical term used by the French to denote feeling and expression.

**AMFIDIANS**, in church history, a congregation of religious in Italy, so called from their professing themselves amantes Deum, lovers of God, or rather amanti Deo, beloved of God. They wore a grey habit and wooden shoes, had no breeches, and girt themselves with a cord. They had twenty-eight convents.

**AMEIVA**, in zoology, a species of *Lacerta* having a verticillated long tail, thirty abdominal scales, and a kind of collar consisting of a double wrinkle beneath. This creature is principally found in South America.



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**AMEL** *a.* (*email*, Fr) The matter with which the variegated worts are overlaid, which we call *enamelled* (Boyle)

**AMELIORA** *NON* *s.* (from the French *ameliorer*, to improve) Improvement Hence we have

**AMELIORATING** SUBSTANCES, in agriculture, such, either animal or vegetable, as, when applied to land, improve it, that is, render it more fertile and productive

**AMLI LOIDES**, in botany See **CINEBARIA**

**AMELLUS** In botany, a genus of the class and order syngenesia polygamia superflua thus generically distinguished receptacle chaffy, down simple, calyx imbricate, florets of the ray undivided It contains three species, all exotic to our own country

**AMELLUS OF VIRGIL** See **ASTER**

**AMEN** (*אמן*, Heb signifies *true, faithful, certain*) It is made use of likewise to affirm any thing, and was a sort of affirmation used often by our Saviour *אמן, אמן, וְהוּא וְאֵנִי* &c Verily, verily, I say unto you Lastly, it is understood as expressing a wish, as Amen, So be it! Numb v 22 or an affirmation, Amen, yes I believe it, 1 Cor xiv 16 The Hebrews, and the five books of Psalms, according to their way of distributing them, with the words Amen, amen; which the Septuagint have translated, *γένοιτο, γένοιτο*, and the Latins, *Fiat, fiat* The Greek and Latin churches have preserved this word in their prayers, as well as alleluiah and hosannah, because they observed more energy in them than in any terms which they could use in their own languages

**AMENABLE** *a.* (*amenable*, French) Responsible, subject so as to be liable to inquiries or accounts (*Daines*)

**AMENANCE** *a.* (from *amener*, French) Conduct; behaviour; obsolete (*Spenser*)

**TO AMEND** *v.* (*amender*, French) 1 To correct, to change any thing that is wrong to something better 2 To reform the life (*Jeremiah*). 3 To restore passages in writers which the copiers are supposed to have depraved

**TO AMEND** *v. n.* To grow better (*Sidney*)

**AMENDE** *s.* (French) A fine, by which recompence is supposed to be made for the fault committed

**AMENDE HONORABLE** a kind of punishment heretofore inflicted in France upon traitors, parricides, or sacrilegious persons, in the following manner The offender being delivered into the hands of the hangman, his shirt snatched off, a rope put about his neck, and a paper in his hand, was then led into court, where he must beg pardon of God, the king, the court, and his country.

**AMENDOR** *a.* (from *amender*) The person that amends any thing

**AMENDMENT** *s.* (*amendement*, Fr) 1 A change from bad to better (*Boyle*) 2 Reformation of life (*Hooker*) 3 Recovery of health (*Shakespeare*)

**AMENDMENT**, in law, the correction of an error committed in a process, and answered

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before judgment If the error be committed in giving judgment, viz if a wrong judgment be given, there they cannot amend it, but the party aggrieved must bring his writ of error However, where the fault appears to be in the clerk who writ the record, it may be amended, chiefly if it be in matter of fact, not in point of law

**AMENDMENT OF BILLS IN PARLIAMENT**, means some alteration made in the original draught; and we read of amendments of amendments, amendments of returns of representatives, &c

**AMENDS** *s.* (*amende*, Fr) Recompence, compensation, atonement (*Raleigh*)

**AMENITY** *s.* (*aménité*, Fr *aménitas*, Lat) Agreeableness of situation (*Brownie*)

**AMENORRHOEA** (*amenorrhœa*, from *α*, priv *σενος*, monthly, and *ρρ*, flux) A total obstruction of the menses from other causes than pregnancy. Dr. Cullen places this genus in the class locals, and order *epusches* His species are, 1. *Emanans menses*, that is, when the menses do not appear so early as is usually expected 2. *Suppressio menses*, when, after the menses appearing and continuing as usual for some time, they cease without pregnancy occurring 3. *Amenorrhœa difficilis*, vel *Menorrhagia difficilis*, when this flux is too small in quantity, and attended with great pain, &c As the opposite term *menorrhœa* is never used in medicine to express natural menstruation, but catamenia, it would be more scientific to exchange *amenorrhœa* for *acatamenia*, and to denominate the *amenorrhœa difficilis* of Cullen *dyscatamenia*

**AMENI** (*amentum*) In botany Called by others *julus*, *nucamentum*, *catulus* In English, catkin, from the French *chaton*, on account of its resemblance to a cat's tail — *Amentum*, *gemmaecum*, *imbricatum*, *commune* *s.* *Inflorescentia*, ex *receptaculo communi paleaceo gemmaeco* A species of calyx, or rather of inflorescence, from a common, chaffy, gemmaceous receptacle or, consisting of many chaffy scales, ranged along a stalk slender as a thread, which is the common receptacle — In the class *monœcia*, the male flowers are frequently thus disposed, as in hazle, birch, oak, walnut, sedge, &c also in willow, poplar, &c in the class *diœcia*. The ament of the willow in vulgar language is called a *palm*.

**AMENTACEÆ** The name of the sixteenth order in Linnæus's *Fragments of a Natural Method*, in *Philosophia Botanica*, and of the fifth at the end of *Genera Plantarum* also, of a class in Tournefort's, Boerhaave's, and Roven's Systems.

**AMENTACEOUS** *a.* (*amentatus*, Lat) Hanging as by a thread (*Miller*)

**AMENTACEOUS FLOWERS**, One species of the aggregate, borne or growing in an ament or catkin.

**AMENŤIA** (*amentia*, from *α*, priv and *μεν*, the mind.) Imbecility of intellect, by which the relations of things are either not perceived, or not recollected. A disease in the class *neuroses*, and order *vesania* of Cullen.

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When it originates at birth it is called *anæsthesia congenita*, when from the infirmities of age, *anæsthesia senilis*, and when from some accidental cause, *anæsthesia acquisita*.

**AMENTUM**, in Roman antiquity, a thong tied about the middle of a javelin, and fastened to the fore finger, in order to recover the weapon as soon as it was discharged.

**AMER** (Bitter), the name given by C. Welter to a detonating and crystallisable substance obtained by him from treating silk with the nitric acid, for the purpose of procuring oxalic acid.

On one part of silk, he poured six parts of nitrous acid of the shops, adding a little concentrated nitric acid. After it had rested two days he distilled this mixture. He then poured what had passed into the receiver on what remained in the retort, and filtered the whole. The oxalic acid crystallizing on the filtre, he put the whole again into the retort, and added a pretty large quantity of water, which had served to wash the filtre. He distilled off a part of the water, but as the residuum did not crystallize, returned, by elevating the receiver, what had passed over, and after repeating this operation several times, obtained for residuum an acid yellow liquor of the weight of the silk employed, and which contained small granulated crystals. This liquor, which shewed no traces of oxalic acid, was then saturated with lime, and concentrated. Alcohol was then added, which, having taken up a matter of a gunny appearance, was evaporated, when there remained a yellow substance mixed with solutions of the nitrate and muriate of lime. These salts were decomposed by carbonate of potash, and the liquor, separated from the carbonate of lime, was subjected to evaporation, which gave golden-coloured crystals, as fine as silk, detonating like gunpowder and producing a black smoke. These crystals, which appear to be of an octahedral form, constitute the substance which Welter has denominated *amer*. Its properties are not very accurately known, as no other person has made any experiments upon it, and his were not repeated. It appears, however, from what has been observed, that *amer* is soluble in water and alcohol, and is deprived of its colour by the oxygenated muriatic acid, that the sulphuric acid disengages from it the colour of the nitric acid, and that muriatic acid precipitates from its solution, small micaceous, whitish, volatile crystals, which in the fire exhale a bitter and inflammable smoke.

Sponge and raw beef were also treated with nitric acid by Welter, who obtained from the first a colourless substance, soluble in concentrated nitric acid, and precipitable from it by water, and from the latter a substance which appeared to be compounded of that afforded by sponge, and the *amer* obtained from silk. This combination, soluble also in concentrated nitric acid, may be separated from it by water under the form of a yellow powder, which does not lose its colour by exposure to the air, and which Welter supposes might be useful in printing.

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To **AMERCE** : a (*amerces*, Fr.) To punish with a fine or penalty (*Milton*).

**AMERCEMENT**, or **AMERCIAMENT**, in law, a pecuniary punishment imposed on offenders at the mercy of the court. It differs from a fine in being imposed arbitrarily, in proportion to the fault, whereas a fine is a certain punishment settled expressly by some statute.

**AMERCER** *s* (from *amerce*) He that sets a fine upon any misdemeanour.

**AMERI**, in botany. See **INDIGOFERA**.

**AMERICA** (from *Americus Vespucius*, falsely said to be the first discoverer of this continent) One of the four parts of the world, and by much the largest. It is bounded on all sides by the ocean, as appears from the latest discoveries, it being formerly supposed to join to the north-east part of Asia. *Americus Vespucius*, from whom it took its name, was a Florentine, who having accompanied *Ojeda*, an enterprising Spanish adventurer, to America, and drawn up an amusing history of his voyage, published it, and it was read with admiration. In his narrative, he had insinuated, that the glory of having first discovered the continent of the new world belonged to him. This was in part believed, the country began to be called after the name of its supposed first discoverer, and the unaccountable caprice of mankind has perpetuated the error, though there is no doubt that not merely Columbus, but Behaim, and Cabot, had visited America many years before Vespucius (See **BEHAIM**, &c.) Many are the conjectures about the peopling of this vast continent, but we cannot relate them here, nor indeed is it greatly to be wished. America is so long, that it takes up not only all the Torrid, but also the Temperate and part of the Frigid Zones. It is hard to say how many different languages there are in America, a vast number being spoken by the different people in different parts, and as to religion, there is no giving any tolerable account of it in general, though some of the most civilized of the aborigines seem to have worshipped the sun. The principal motive of the Spaniards in settling so many colonies here was the thirst of gold; and indeed they and the Portuguese are possessed of all those parts where it is found in the greatest plenty. This vast continent is divided into N. and S. America, which are joined by the isthmus of Darien. It has the loftiest mountains in the world, such as those that form the immense chain called the Andes, and the most stupendous river, such as the river Amazon ("the mighty Orellana"), the "sea-like Plata, the Orinoko, the Mississippi, the Illinois, the Misauras, the Ohio, the St. Lawrence, the Hudson, the Delaware, the Savannah, the Potomac, &c." Besides the Europeans, who inhabit the interior parts, and the United States of America, who possess some of the finest provinces that formerly belonged to Great Britain, the different European powers have rich and flourishing colonies here. The American States are fifteen in number, each having a separate local government, but they are formed into one federal republic. These

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states long flourished as provinces of Great Britain, but parliament attempting to tax them by its sole authority without the intervention of their assemblies a civil war ensued, a congress was formed, which, in 1776, disclaimed all dependence on the mother country, the French king entered into an alliance with them in 1778, the colonies powerfully assisted by France, were successful, and Great Britain, in 1782, acknowledged their independence in preliminary articles of peace, finally ratified by the definitive treaty in 1783. The Americans have since formed a new federal constitution. Between America (the New World) and the Old World, are several very striking difference, the most remarkable of which is, the general predominance of cold throughout the whole extent of this vast country. Here the rigour of the Frigid Zone extends over half that which should be temperate by its position, with regard to the same parallels of latitude in the Old World, and even in those latitudes where winter is scarcely felt on the Old Continent, it reigns with great severity in America, though but for a short period. Nor does this cold, so prevalent in the New World, confine itself to the Temperate Zones, but extends its influence, likewise to the Torrid Zone, considerably mitigating the excess of its heat. The natives of this vast country are in some respects different from those of the Old World, for the skins of all the men, except the Eskimaux, are of a red copper colour, and they have no beards, or hair on any part of their bodies, except the head, where it is, black, straight, and coarse. In a country of such vast extent there are, no doubt, as great a variety of soils as there are of climates. In short, America may be called an immense treasure of nature, producing most, if not all, of the plants, grains, fruits, trees, woods, metals, minerals, &c. to be met with in the other parts of the world; and it not only in as great, if not in greater quantities, but many of these in a much higher perfection. By the discovery of this country, the Europeans have derived many real and solid advantages. Gold and silver have been more plentiful in the countries of Europe since their connection with America, and the *Materia Medica* has derived no small assistance from the productions of this continent. The various districts which compose this vast country shall be treated of in their respective places, and the reader may farther consult the interesting works of Morse, Winterbotham, &c.

**AMERICUS VESPUTIUS** See *Vesputius*.

**AMERYMINUM** In botany, a genus of the class and order diadelphia decandrum, calyx somewhat two-lipped, legum. compressed, bilobed, two-valved, capitate; seeds a few, solitary. There are two species, mostly natives of the West Indies, and each one or two annual shrubs, and the roots are trees. The genus is in the honour of the West India islands.

**AMERIOLA**, in ancient geography, a town

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of Latium, mentioned by Pliny, but not now existing.

**AMERSHAM**, a borough town of Buckinghamshire, with a market on Tuesday. It sends two members to parliament. Lat 51 40 N. Lon 0 35 W.

**AMES** (William), D D a learned independent divine, famous for his controversial writings, was born in 1676, and educated at Christ's college, in Cambridge. In the reign of king James I he left the university, and soon after the kingdom, on account of his being unwilling to conform to the rules of the church, and retired to the Hague, where he had not been long before he was invited to accept of the divinity chair in the university of Franeker, in Friesland, which he filled, with admirable abilities, for above twelve years, during which his fame was so great, that many came from remote nations to be educated under him. He from thence removed to Rotterdam for a change of air which his health demanded, and here he continued during the remainder of his life. His controversial writings, which compose the greatest part of his works, are chiefly against Bellarmine and the Arminians. He also wrote, 1 A fresh Suit against the Ceremonies 2 Lectures in Psalmos Divinis 3 Medulla Theologiae, and several papers relative to the sciences. He died of an asthma, at Rotterdam, in November 1633.

**AMES ACE** (a corruption of *ambs ace*) Two aces on two dice (*Dryden*)

**AMBSBURY** See *AMBRESBURY*.

**AMPHODICAL** (from *a* and *method*) Out of method, irregular.

**AMLIHYST** In mineralogy, a species of quartz. See *QUARTZUM*.

**AMETHYST**, in heraldry, signifies the purple colour in the coat of a nobleman, which in gentlemen's escutcheons below that degree, is called purple, and in those of sovereign princes, Mercury.

**AM-THYSTFA** In botany, a genus of the class and order diandria monogynia. Corolla five-lobed, the lowest segment more expanding, stamens approximate, calyx somewhat campanulate, seeds four, gibbous. The only known species is a native of Siberia, with fine blue flowers in small umbels.

**AM-THYSTINA**, in entomology, a species of chrysomela.

**AMETHYSTINE**, is applied, in antiquity, to a garment dyed of the hue of amethyst.

**AMHARA**, a kingdom of Abyssinia, situated between the two rivers Bashilo and Gashen, and having Begemder to the north, the Nile and the kingdom of Gogam to the west, Wallaka to the south, and Angot to the eastward about N lat 11 and E lon 39. Ludolf has written a short essay towards a dictionary and grammar of the Amharic. See Ludolf's Hist. Ethiop. p 78, and Bruce's Travels, vol 1 p 425.

**AMHERST**, one of the Magdalen islands in the gulf of St. Lawrence. Lat 46 15 N. Lon 61 30 W. Greenwich.

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**AMHERST**, one of the counties of Virginia, in North America. It sent 896 men to the national militia.

**AMHURST** (Nicholas), was born at Mardon, in Kent, and educated at Merchant Taylors school; from thence he was removed to St John's college, Oxford, where his conduct was so irregular that he was expelled, which induced him to publish, in 1724, a satirical poem against the university, called *Oculus Britanniae*. He continued the same attack in a series of papers called *Terra Filius* which were collected and published in two volumes 12mo 1726. On quitting the university, he settled in London, and became a writer by profession. His most celebrated undertaking was "The Craftsman," which was carried on for many years with great success. In this paper he was assisted by lord Bolingbroke and Mr Pulteney, who totally neglected him when they got into place. He died, it is supposed, of a broken heart, in 1741.

**AMIA**. In ichthyology, a genus of the order abdominal of which the following is its generic character: head flattened, bony, rough, naked, appearing as if excoriated; teeth in the jaws and palate numerous, sharp, erect; cirri two, near the nostrils, gill-membrane twelve-rayed, body scaly.

The only known species is denominated calva, which is thus specifically described: tail with a black spot; inhabits Carolina, in fresh waters, body roundish, it is seldom eaten. Gill covers obtuse bony, gullet with two bony plates, striate from the centre, lateral line straight, pectoral fins not larger than the ventral, ventral placed behind the equilibrium, dorsal long, sloping, tail rounded.

**AMIBLY** *a* (amicable, Fr.) 1. Lovely, pleasing (*Hooker*). 2. Pretending love, showing love (*Shaks*).

**AMIBLYNESS** *s* (from *amiable*) Loveliness, power of raising love (*Addison*).

**AMIBLY** *ad* (from *amabile*) In such a manner as to excite love.

**AMIANTHINITE**, of Ki wan, in mineralogy. See *STRAHLSTEIN*.

**AMIANTHUS**. See *ASBESTUS*.

**AMIATUS**, in entomology, a species of *hesperia*.

**AMICABLE** *a* (*amicabilis*, Lat.) Friendly, kind (*Pope*).

**AMICABLE BENCHES**, in Roman antiquity, seats allotted for the judges *pedaneæ*, or inferior judges.

**AMICABLE NUMBERS**, such as are mutually equal to the sum of one another's aliquot parts. Thus the numbers 284 and 220 are amicable numbers, for the aliquot parts 1, 2, 4, 5, 10, 11, 20, 22, 44, 55, 110, of 220, are together equal to the other number 284, and the aliquot parts, 1, 2, 4, 71, 142, of 284, are together equal to 220. Two other amicable numbers are 17296 and 18410. The next pair are 9363584 and 9437056. These three pairs of amicable numbers were discovered by F Schooten, who also gave the following rule for ascertaining other pairs: let  $a = 2$ , and  $n$  be

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some integer number such that  $3a^n - 1$  and  $6a^n - 1$ , and  $18a^n - 1$  be all three prime numbers, then will  $(18a^n - 1) \times 2a^n$  be one of the amicable numbers, and the sum of its aliquot parts is the other.

M. John Gough has lately investigated some properties of these numbers, especially of the Cartesian form, where  $ax$  and  $ay$  are amicable numbers, consisting of a common measure  $a$ , multiplied by the primes  $x$ ,  $y$ , and  $z$ . He shews, that if a pair of amicable numbers be divided by their greatest common measure, and the prime divisors of these quotients be severally increased by unity, the products of the two sets thus augmented, will be equal. Put  $q$  = the sum of the divisors of  $a$ , then if  $a$  be given  $q$  is given, but  $q$  must be less than  $a$ , and if two sets of primes  $d, x$ , in  $1, r, y, z$ , can be found, which will make  $(1+d)(1+r) = (1+x)(1+y)(1+z)$  &c. and also give the following proportion,  $a : q :: (1+d)(1+r) : yz - (1+d+1)$ , then will  $ad, x, y, z$ , be amicable numbers.

In the amicable numbers of Des Cartes no two of the primes  $x, y$  and  $z$ , can be equal, nor can any of them be  $= 2$ , nor can  $a$  be a prime  $q$  must be less than  $a$  yet greater than  $\frac{1}{2}a$ , and  $a$  must be a power of 2.

If the primes  $x, y, z$ , be given, making  $x+1 = (y+1)(z+1)$ , to find if they can constitute amicable numbers, divide  $z+1$  by  $y+1$ , and call the quotient  $p$ , then if  $p$  be not 2, nor a power of 2, the thing is impossible; but if  $p$  be some power of 2, divide  $y+1$  by  $p+1$ , and put the quotient  $= f$ , then if  $f$  be neither 2 nor a power of 2, the thing is impossible; but if  $f = 2^n$ , the common multiplier  $a = 2^f$ . *Leibourn's Math Repos No 7 N 5*.

**AMICABLENESS** *s* (from *amicable*) Friendliness, goodwill.

**AMICABLY** *ad* (from *amicable*) In a friendly way (*Prior*).

**AMICE** *s* (*amict*, Fr.) The first or undermost part of a priest's habit, over which he wears the alb (*Milton*).

**AMICIA**. See *ARMUCIUM*.

**AMICIUS**, an upper garment worn over the tunic. Among ecclesiastics, it was of a square figure, it covered the head and shoulders, and buckled before the breast.

**AMICIUM**, in antiquity, a woman's upper garment.

**AMID**, the same as *Diarbekr*.

**AMIDA**, a god worshipped by the Japanese, who has many temples erected to him in the island of Japan, of which the principal is at Jedo.

**AMID** *Amidst* *prep* (from *a* and *mid*) 1. In the midst (*Milton*). 2. Man- gled with, surrounded by (*Dryden*). 3. Among conjoined with (*Addison*).

**AMIENS** (the ancient *Samatobrius*) A famous city of France, it is now the episcopal town of the department of *Somme*. The cathedral is a very fine and stately building. Here are nearly 4000 inhabitants, the greater part of whom are employed in the linen and

woollen manufactures Lat 49. 54 N Lon 2 23 E.

**AMILCAR.** There were many Carthaginians of this name, the most celebrated of whom was Amilcar, surnamed Barcas, father to the celebrated Hannibal. He was general in Sicily during the first Punic war, and after a peace had been made with the Romans, he quelled a rebellion of slaves, who had besieged Carthage, and taken many towns of Africa, and rendered themselves so formidable to the Carthaginians that they begged and obtained assistance from Rome. After this, he passed into Spain with his son Himilbal, who was but nine years of age, and laid the foundation of the town of Barcelona. He was killed in a battle against the Vettones, B C 237. He had formed the plan of an invasion of Italy, by crossing the Alps, which his son afterwards carried into execution. His great enmity to the Romans was the cause of the second Punic war. He used to say of his three sons, that he kept three lions to devour the Roman power.

**AMISS** *ad* (a and miss) 1 Faultily, criminally (*Addison*) 2 In an ill sense (*Farrar*) 3 Improper, unfit (*Tillotson*) 4 Wrong, not according to the perfection of the thing (*Dryden*) 5 Reproachful, irreverent (*Daniel*) 6 Impaired in health

**AMISSIO** *s* (*amissio*, Latin) Loss.

**To AMIT**, *s* a (*amitto*, Lat.) To lose (*Brown*)

**AMITTERE LEGEM TERRÆ**, among lawyers, a phrase importing the loss of liberty of swearing in any court: the punishment of a champion overcome or yielding in battle, of a juror found guilty in a writ of attain, and of a person outlawed.

**AMITY**, *s* (*amitie*, Fr.) Friendship

**AMITTE**, See *AMITTE*

**AMMATA**, or **AMMATA** (from *ammā*, vincula, in Latin) A technical term denoting the bandage employed to sustain ruptures, or hernia.

**AMMANT**, or **AMMANT**, in the German law, a judge who has the cognomen

**AMMANT** is also used among the French for a public notary, or officer who draws up instruments and deeds.

**AMMANNIA** In botany, a genus of the class and order tetrandria monogynia. Corol four-petalled, inserted in the calyx, or else none; calyx one-leaved, plaited, eight-toothed; inferior, capsule four-celled. There are several species, some of Indian and some of West Indian birth.

**AMMATA**, in ancient geography a town of Asia, in Palestine, belonging to the tribe of

**AMM.** *Bignoniaceae*, a genus of the class and order pentandria digynia. It produces parthenocarpous, globose, fleshy fruits; fruit woody. The tree is four to six feet high, common to the southern part of India and the island of Ceylon. The following are the principal species: *Amma* L. a large tree, the bark is used as a vermifuge, in a decoction.

the seeds of which have a grateful smell, somewhat like that of orange, and were formerly administered as a carminative.

**AMMIUM**. *P. Asm.*, which see 2 Cinnabar

**AMMON**, or **HAMMON**, in heathen mythology, the name of the Egyptian Jupiter, worshipped under the figure of a ram. Hammon, the god of the Egyptians, was the same with the Jupiter of the Greeks.

**AMMONIA**, or **VOXATILE ALKALI**, is composed of about 80 parts of azote and 20 of hydrogen, rendered gaseous by caloric, in which form only it is in a state of purity, though the name is very commonly applied to a solution of the gas in water, with which it readily combines, forming the liquid ammoniac of the shops, or the aqua ammoniacum pars of the London Pharmacopoeia.

This gas was discovered by Dr. Priestley, and may be obtained pure by heating the liquid ammonia in a retort connected with the mercurial pneumatic apparatus; or by mixing together three parts of quick lime, and one of muriat of ammonia (sal ammoniac), both in powder, heating the mixture in a retort, and collecting the gas, in a similar manner, over mercury, the muriat is decomposed, the acid uniting with the lime, and the ammonia is liberated in the form of gas. It is necessary, however, that a considerable portion of the gas first raised being adulterated with common air, should be suffered to escape. Ammonia is also one of the constant products of putrefaction, being always evolved during the spontaneous decomposition of animal and vegetable substances: it does not, however, exist in them ready formed, but is generated in the process by the union of its principles, hydrogen and azote.

The chief properties of this gas are as follow:

It is transparent, like common air, in proportion to which its weight is as 3 to 5, its specific gravity being .000732, its taste is acid and caustic, though it does not corrode animal bodies, its smell is highly pungent. It is unfit for respiration, producing death in those animals who breathe it: the flame of a candle is extinguished by it, being previously enlarged by another flame of a pale yellow color which surrounds it. It is amazingly expandible by heat, and condensible by cold into a liquid. The electric fluid also increases its bulk, and decomposes it. With water it has so strong an affinity as to be rapidly absorbed by it, to the amount of more than a third of its weight of gas, thus forming liquid ammoniac, or solution of ammonia, or, as it was formerly termed, caustic spirit of ammoniac. When saturated, the specific gravity of the solution is .9054. The addition of carbonic acid to this fluid composes the fiaschum of commerce, or the volatile alkali as formerly known, before the discovery of Priestley and Black enabled chemists to obtain it in a state of purity. (See CARBONAT OF AMMONIA.) Liquid ammonia has the same properties as the gas, only it is more than in a less concentrated degree, for

the gaseous aggregation being, according to one of the laws of affinity, much weaker than that of liquids, the gas must have a greater tendency to combination than the liquid. It has been observed that, when ice is presented to ammoniacal gas, it is melted, and yet cold is produced, whereas, in combining with water, heat is evolved. This gas is also eagerly absorbed by alcohol, ether, charcoal, sponge, bits of cloth, and all porous bodies. It may be decomposed, not only by electricity, but by oxygenated muriatic acid gas at common temperatures, and at a high temperature by means of black oxide of manganese, also by being passed through a narrow tube of porcelain or glass made red-hot, or by a similar passage in mixture with oxygen gas, or with common air, when a detonation takes place, water is formed, and azotic gas is emitted.

Ammonia is capable of combining with several of the acids, as the sulphuric, nitric, muriatic, boracic, fluoric, carbonic, &c. forming with them so many neutral or secondary salts, distinguished by the names sulphat of ammonia, nitrat, muriat, borat, fluat, carbonat, &c. of ammonia, for an account of which see their respective terms. It has no sensible action on earths, but unites with sulphur in the state of vapour, forming a sulphuret of ammonia, which decomposes water, and becomes thereby hydrogenated, or hydrogenated sulphuret of ammonia, formerly called the fuming liquor of Boyle. When ammonia is made to pass through ignited charcoal, it forms it with prussic acid.

Though ammonia is incapable immediately of combining with the metals, yet by the decomposition of the water with which it is united, some of them are converted into oxides, and are thus rendered soluble. The oxides of cobalt, copper, silver, nickel, gold, tin, bismuth, and mercury, may be dissolved by digestion, in liquid ammonia: the four first have lately been examined with a view to the purification of nickel by ammonia, by Mr R. Phillips whose paper on the subject may be seen in the Philos. Mag. Vol. XVI. p. 312, and who has ascertained that the affinity of ammonia for these four oxides is in the order in which they are here placed. With the oxide of gold, ammonia forms a compound, formerly termed aurum fulminans, or fulminating gold, which explodes with amazing violence on being heated or rubbed, with oxide of silver, another compound is formed, of a similar nature, called argentum fulminans, or fulminating silver, and with the red oxide of mercury, another substance is produced which also detonates violently under the same circumstances. A more detailed account of their properties, with the methods of preparing them, will be given under the article **FULMINATING SUBSTANCES**. See also the terms **GOLD, SILVER, and MERCURY**.

**AMMONIA MURIATA** The article to which this name is given in the pharmacopœia, being a muriat of ammoniac, is called in the new chemical nomenclature, **MURIAS AM-**

**MONIACÆ**. It is found in great abundance in nature, and may be prepared from a variety of substances. (See **SAL-AMMONIAC**.) It derives its name of ammonia from the country of this denomination (a part of Africa), from which it was formerly supposed to have been first imported.

**AMMONIA PREPARATA** (*ammonia*) Prepared ammonia. **SAL VOLATILE SALS AMMONIACÆ** **SAL ALKALI VOLATILE** The article under this name in the pharmacopœia is called carbonis ammoniacæ crystallus in the new chemical nomenclature, it being a pure crystallized carbonat of ammonia. The preparation termed **SAL VOLATILE CORNU CERVI**, although obtained by a different process, is in fact the same thing. It possesses stimulating, nervine, antacid virtues, and is in these points of view in high estimation in doliety, typhus, ataxia, atonic spasms, paralysis, syncope, arthritis, rheumatism, &c.

**AMMONIAC** (*ammoniac*) Ammoniacal gas. The substance to which this name is given in new chemical nomenclatures, is what was formerly called volatile alkali. It is a fluid resembling air, and has the same transparency and elasticity; it is rather lighter, however, its smell is more penetrating, and its taste is acrid and caustic; hence it produces inflammations of the eyes, catarrhs, &c. diseases to which those people who are exposed to its action, from being near putrid animal substances, urina, &c. and in laboratories, are very subject. This air, or ammoniacal gas, chemists have ascertained to be a compound substance, consisting of hydrogen and azot. Although ammoniac has not yet been employed medicinally in its aeriform state, its compounds are not neglected. Ammoniac is readily absorbed by water, and when this fluid is saturated with it, it is termed **FLUID**, or **CAUSTIC VOLATILE ALKALI**, **ALKALI VOLATILE CAUSTICUM**, **ALKALI ANIMALE PURUM**, and in the pharmacopœia, **AQUA AMMONIÆ PURÆ**. The sulphat of ammoniac, a salt formed by the combination of ammoniac with the sulphuric acid, is recommended for its diuretic and deobstruent qualities, and is described by Bergman under the title of **ALKALI VOLATILE VITRIOLATUM**, and by Glauber by the name **SAL AMMONIACUM SECRETUM**. Ammoniac and nitric acid form a salt, the nitrat of ammoniac, **NITRUS AMMONIACÆ**, which possesses deobstruent virtues, and is described by Bergman under the name of **ALKALI VOLATILE NITRATUM**. The direct combination of muriatic acid with ammoniac forms the muriat of ammoniac. See **AMMONIA MURIATA** and **SAL-AMMONIAC**.

**AMMONIACUM** Gum ammoniac (*ammoniacum*, from the country that was first observed to produce it.) A concrete gum, composed of little lumps or tears, of a strong and rather unpleasant smell, and mucous taste accompanied with bitterness. It is at present imported into this country from Turkey and the East Indies. Internally it is employed by physicians in various and various quantities of expectation. Externally it is used in the form of



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plaster with acetum scilla, as a powerful discutient in pneumonia, and other local inflammations

**AMMONIACUM GUMMI** See **GUM AMMONIACUM**

**AMMONITE**, in natural history, the same with the cornua ammonis, or snake-stones

**AMMONITES**, in ancient history, the descendants of Ammon

**AMMONIIS** (anc geog), a country of Arabia Petrit, occupied by the children of Ammon, whence the appellation Its limits, partly to the west, and partly to the north, were the river Libbuh, whose course is no where determined, though Josephus says that it runs between Rabbath-Ammon, or Philadelphia, and Gerast, and falls into the Jordan

**AMMONIURES** (Metallic) Substances composed of the different metals united to ammoniac There are not many of these at present known, and those few which are known have been but imperfectly investigated Brugnatelli (Ann de Ch no 98) has examined the ammoniures of cobalt, mercury, zinc, copper, and arsenic

Ammoniure of cobalt is formed by dissolving the grey oxide of this metal, called zaffar, or the yellow oxide, in ammonia The latter is the most pure, and possesses the following properties it has a yellow, and sometimes a rose colour, is not decomposed by acids, though it is deprived of its colour by the muriatic acid, it is changed to grey by prussiate of potash, and to a dark colour inclining to black, by sulphure of potash, it decomposes borate of soda, precipitating very white borate of cobalt P M vol xi p 229

From this substance Brugnatelli obtained a peculiar acid, to which he gave the name of **COBALTIC ACID**, in account of which may be found under its proper term

**AMMOPHILA** Sand-wasp This insect was till lately regarded as a species of the Linnæan genus *sphecx*, and order hymenoptera Upon the authority of Mr Kirby, and a higher in this order of entomology we could not quote, we have ventured to place it in a genus by itself, and have been preceded in the arrangement by Dr Furton It is probable that various others of the *spheges* or *phexes*, might with propriety be removed into the same genus Thus divided, its character is as follows and the reader should carefully compare it with the generic character of the *sphecx*, as drawn by Linnæus, for which see *SPHECX* snout exsic, inflected, concealing a bifid, retractile, tubular tongue jaws forcipated, three toothed at the tip, antennæ filiform in each sex, with about fourteen articulations, eyes oval, wings plane, strong pungent, concealed in the abdomen

The four species of the *sphecx* referred to this new genus, are the *a vulgaris*, *a affinis*, *a muricatus*, and *a argentea* They are all inhabitants of Europe The first is the *sphecx fabulo-a* of Linnæus and Fabricius, it dwells in sandy sunny banks, where it digs a hole with its forefeet, and buries the corpses of the larva of a

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moth or a half-dead spider, in the body of which it deposits its eggs, and then covers up the orifice

**AMMORYTES** *Iauca* In ichthyology, a genus of the Linnæan order apodal, or without ventral fins Its generic character is head compressed, narrower than the body, upper lip doubled in, lower jaw narrow, pointed, teeth very sharp, gill membrane seven rayed, body long, square, the sides rounded caudal fin distinct

Of this genus, which takes its name from its fondness for diving into and burying itself in the sand, there is but one known species, the *a tobianus*, or sand launce, which it inhabits the sandy shores of the northern seas, is from nine to twelve inches long, buries itself on the recess of the tides a foot deep in the sand, and in fine weather rolls itself up and lifts its nose just above the sand, and is the prey of other rapacious fishes The flesh is good, but it is commonly used for bait See Nat Hist. pl IV

The head of the *a tobianus* is oblong, eyes small, pupil black, iris silvery, in the jaw are two rough oblong bones, region of the gills silvery back blue, beautifully varied with green, with silvery sides and belly, lateral line straight, vent nearer the tail, with a brown spot close by it, rays of the fins soft, tail forked

**AMMOSCHISTA**, a genus of stones of a laminated structure, and splitting only horizontally, or into flat plates

**AMMUNITION**, a general name for all warlike provisions, but more particularly powder, ball, &c Ammunition urns, utensils of war, gunpowder, imported without licence from his majesty, &c, by the laws of England, forfeited, and triple the value And again, such licence obtained except for furnishing his majesty's public stores, is to be void, and the offender to incur a premium, and to be disabled to hold any office from the crown

**AMNESIA** (from *a priv* and *μνησις*, memory) Forgetfulness See **AMNESIA**

**AMNISTIA** (from *a priv* and *μνησις*, memory) Forgetfulness, a morbid want of memory

**AMNISTY**, or **AMNISTIA**, a kind of general pardon, which a prince grants to his subjects, by a treaty or edict, wherein he declares, that he forgets and annuls all that is past, and promises not to make any farther inquiry into the same The word is *αμνηστια*, *amnestia*, which was the name of an ancient law of this kind, passed by Thrasylulus upon the expulsion of the thirty tyrants out of Athens Andocides, an Athenian orator, whose life is written by Plutarch and of whom we have an edition of the year 1775, gives us, in his Oration upon Mysteries a formula of the amnesty, and the oaths taken thereupon

**AMNION**, **AMNIOS** (*αμνιον*, from *αμνς*, a lamb, or lamb's skin, so called on account of its delicacy) The soft internal membrane that surrounds the fetus

**AMNIO**, **LIQUOR OF THE**, is a fluid in which all the young of the mammalia are



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enclosed previously to their birth. It has recently been examined by the French chemists, who, by abolishing the old method of analysis by fire only, and introducing many improvements in its stead, have done much towards increasing our acquaintance with vegetable and animal substances, though these are yet much less perfectly known than the different kinds of inorganic matter. Two species of the amniotic liquor have been examined by Vauquelin and Buniva that afforded by the human female, and that procured from the cow. These are very different from each other, and possess respectively the following properties.

The first is slightly saline to the taste, of a dilute white colour, though by filtration it becomes transparent. It froths by agitation, becomes semisopaque when heated, changes the colour of tincture of violets to green, and slightly reddens that of tornsol. The acids clarify it, alcohol throws down a light precipitate, infusion of gall-nut, a brown one very copiously, and nitrate of silver a white one, insoluble in nitric acid. It appears, therefore, to be composed of an albuminous matter, similar to that of the blood, a muriatic salt, probably muriate of soda, and a small quantity of free or carbonated alkali. Its specific gravity is 1.005.

The liquor obtained from the amnios of the cow is of a brownish red colour, an acid bitterish taste, a viscous consistence, and an odour much like that of vegetable extract. It reddens the tincture of tornsol, gives an abundant precipitate with muriat of barytes, and deposits a large quantity of reddish matter by the action of alcohol. Its specific gravity is 1.028. On evaporation, a thick scum rises to the surface, and after being reduced to a quarter of its bulk, a number of long, acid, needle form crystals are produced as the liquor cools, on continuing the process till the matter is brought to the consistence of honey a fresh deposition of crystals takes place, which differ in form from the preceding, and are sulphat of soda. The extractive matter, on separation, has the appearance of a compact adhesive cement, of a reddish brown colour, and a peculiar indescribable flavour, and the crystals first obtained, exhibiting properties different from those of all the known acids, has received the denomination of the

**AMNIOTIC ACID.** This acid was first discovered, as stated above, in the amniotic liquor of the cow. It combines readily with the caustic alkalis, forming a very soluble salt, but will not decompose the carbonated alkalis without the assistance of heat. It is separated from its all line combinations by the mineral acids, in form of a white crystalline powder. It produces no change in the aqueous solution of the alkaline earths. It is destroyed by heat, leaving behind a spongy coal. *Annales de Chimie*, vol xxxiii p 269.

**AMOL**, a town belonging to the Usbecks, in Asia, situated on the river Gihon. Lat 39 20 E. Long 64 30 E.

**AMOMUM** (from *hamom*, Arab a pin-

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geon, whose foot it was thought to resemble.) **Ginger.** A genus of the class and order monandria monogynia. Calyx five-lobed, unequal, cylindrical, corol three parted, unequal, expanding, nectary two lipped, nearly erect. There are ten species produced in the East and West Indies, and one, the *granum paradisi*, on the coasts of Guinea. It is the dried root of the a zingiber that constitutes the ginger of our shops, for which see **ZINGIBER**.

**AMOMUM GERMAN.** See **SISON**.

**AMOMUM PIINII.** See **SOIANUM**.

**AMOMUM CARDAMOMUM.** See **CARDAMOMUM MINUS**.

**AMOMUM GRANUM PARADISI.** See **GRANA PARADISI**.

**AMONG, AMONGST** *prep* (among, Saxon) 1 Mingled with (*Milton*) 2 Conjoined with others, so as to make part of the number (*Addison*).

**AMONTON'S** (William) a French philosopher, was born in Normandy in 1663. Being seized with an incurable deafness, he applied himself to the study of mechanics and practical mathematics. In 1687, he presented a new hygroscope to the Academy of Sciences, which was approved. He also was one who found out a method to convey information from one place to another by signals, which is that now known by the name of the telegraph. In 1695, he published a book on the construction of barometers, thermometers, &c. In 1699, he was admitted a member of the Royal Academy, and read there a new theory of friction. He died in 1705, aged forty-two years. Many of his papers are printed in the different volumes of the Memoirs of the Academy of Science viz the volumes for 1696, 1699, 1702, 1703, 1704 and 1705.

**AMORGUS**, an island of the Archipelago, fertile in corn, wine, and oil. Lat 36 20 N., Long 26 15 E.

**AMORIS POMUM.** In botany. See **SOLANUM**.

**AMORIST** *s* (from *amour*) An innamorito, a gallant, a man professing love, (*Boulev*).

**AMORITIS**, a people descended from Amorrhæus, according to the Septuagint and Vulgate, Emorreus, according to other expositors, Hamori, according to the Hebrew, or Amorite, according to our version of the Bible, who was the fourth son of Cham. Gen x 16. The name Amorte is often taken in Scripture for all Canaanites in general.

**AMOROSO** in the Italian music, implies tenderly, with affection and supplication.

**AMOROUS** *a* (*amuroso*, Ital) 1 In love, enamoured (*Shakspeare*) 2 Naturally inclined to love, fond (*Prior*) 3 Belonging to love (*Waller*).

**AMOROUSLY** *ad* (from *amorous*) Fondly, lovingly (*Donne*).

**AMOROUSNESS**, *s* (from *amorous*) Fondness, lovingness, love (*Boyle*).

**AMORPHA** *Eustachiodora* A genus of the class and order diadelphus decandria.

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*Calyx* campanulate, five cleft banner ovate, concave, wingless and keelless, legume fall de, two seeded There are two species, both natives of Carolina a fruticosa a shrub with pinnate leaves, and purple flowers and a pubescens, a herb pubescent, with bluish-white flowers

**AMORI** *ad* (*a la mort* Fr) In the state of the dead, spiritless (*Shakspeare*)

**AMORTIZATION, AMORTIZEMENT** *s* (*amortissement*, Fr) The right or act of transferring lands to mortmain (*Ayliffe*)

**To AMORTIZE** *v a* (*amortir*, French) To alien lands or tithements to any corporation or fraternity (*Bloint*)

**AMORY** (Thomas), a dissenting divine, was born at Linton, in Somersetshire, in 1700 He received his education under Mr Chidwick, and afterwards under his uncle, Mr Henry Grove, whom he succeeded as principal tutor in the academy at Taunton He officiated as a dissenting minister in his native town from 1730 to 1739, when he removed to London, and became afternoon preacher in the congregation in the Old Jewry In 1768, the university of Edinburgh conferred on him the degree of D D At this time he became one of the lecturers at Salters-hall, previous to which he had succeeded Dr Chandler in the pastorate at the Old Jewry In 1770, he became morning preacher at Newington-green He was one of the committee appointed by the dissenters, in 1772, to procure in extension of the act of toleration He died in 1774, and was interred in bunhill fields burying-ground Dr Amory's character was very amiable, and his sermons, in two volumes octavo, shew him to have been in able divine He wrote the Life of Mr Henry Grove Memoirs of Dr Benson, and of Dr Samuel Chandler (*Hatians*)

**AMOS**, the third of the twelve lesser prophets, was a herdsman of the city of Tekoa He prophesied under Uzzias and Jeroboam II and foretold the captivity and re-establishment of the ten tribes He was put to death by Amazias, priest of Bethel, about 783 years before Christ He ought not to be confounded with Amos, the father of Isai

**To AMOVE** *v a* (*amovco*, Latin) 1 To remove from a post or station 2 To remove, to move, to alter (*Shakspeare*)

**To AMOUNT** *v n* (*monter* French) To rise to in the accumulative quantity, to compose in the whole (*Burnet*)

**AMOUNT** *s* The sum total (*Thomson*)

**AMOUR** *s* (*amour* Fr) An affair of gallant y or intrigue (*Southe*)

**AMVOY** or **FMOV**, an island belonging to the province of Fokien, on the SW coast of China here the English once had a factory Lat 24 30 N Long 118 45 E

**AMPELIS** Chatterer in ornithology, a name to is given to the order passerus, thus characterized bill straight, convex, subincurved, each mandible notched nostrils covered with bristles, tongue sharp, cartilaginous, bi-

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fid, middle toe connected at the base to the outermost

Of this genus there are fourteen known species 1 a garrulus, waxen chatterer (see Nat Hist pl VI), 2 a pompodora, pompadour chatterer, 3 a cinnifex, red chatterer, 4 a coccinea, scarlet chatterer, 5 a colinga, purple breasted, 6 a maynana, silky, 7 a cayana, purple throated, 8 a tersa, blue-breasted, 9 a crunculata, catunculated, 10 a variegata, variegated, 11 a cinerea, grey, 12 a phanicea, red-winged, 13 a lutea, yellow, 14 a cristata, crested

They are all natives of Africa or America, except the garrulus, or waxen chatterer, which is sometimes met with in our own country, and in length and size resembles a starling Pennant asserts that this bird appears annually about Edinburgh, and feeds on the berries of the mountain ash It is also said to breed in parts more northerly, and to form its nest in the holes of the rocks

**AMPEMERINAS, AMPHEMERINUS** (from *αμπερι*, *about*, and *μεμερα*, *a day*) A quotidian ague or intermittent

**AMPHIARAUS**, son of Oicleus, or according to others, of Apollo, accompanied the Argonauts in their expedition He was famous for his knowledge of futurity He married Eriphyle, the sister of Adrastus king of Argos, by whom he had two sons, Alcmæon and Amphilocheus When Adrastus, at the request of Polyneus, declared war against Thebes, Amphiarus secreted himself, not to accompany his brother in-law in an expedition in which he knew he was to perish But Eriphyle who knew where he had concealed himself was prevailed upon to betray him by Polyneus, who gave her, as a reward for her perfidy, a famous golden necklace set with diamonds Amphiarus being thus discovered, went to the war, but previously charged his son Alcmæon to put to death his mother Eriphyle, as soon as he was informed that he was killed Amphiarus was swallowed up in his chariot by the earth as he attempted to retire from the battle The news of his death was brought to Alcmæon who immediately executed his father's command, and murdered Eriphyle Amphiarus received divine honours after death, and he had a celebrated temple and oracle at Oropos in Attica

**AMPHIARTHROSIS** (from *αμφι*, *either*, and *arthrosis*, *an articulation*) A mixed kind of articulation, which admits of an obscure motion, as in the vertebrae of metatarsal bones

**AMPHIBIA** (*αμφίβια*, *utrinque vitam habentes*, from *αμφι*, *contra* and *βίωσιν*, *vita*) Amphibious animals or capable of existing in two distinct elements as air and water In zoology, the third class in the Linnæan system The following is its classical character heart, one auricle one ventricle, blood cold and red, jaws incumbent, penis (frequently) double, eggs (usually) membranaceous, organs of sense tongue, nostrils, eyes, ears, covering a naked skin, supporters various, in some none creep in warm places and hiss

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This class of animals is farther distinguished by a body cold and generally naked, a countenance stern and expressive, voice harsh, colour mostly lurid, and filthy odour. A few are furnished with a deadly poison, all have cartilaginous bones, slow circulation, exquisite sight and hearing, large, pulmonary vessels, lobate liver, oblong, thick stomach, and cystic, hepatic and pancreatic ducts they are deficient in diaphragm, do not transpire, can live a long time without food, are tenacious of life, and have the power of re-producing parts which have been lost or destroyed, in a most wonderful manner, some undergo a metamorphosis, some cast their skin, some appear to live promiscuously on land or in the water, and some are torpid during the winter.

They were formerly divided into four orders, a nantes, and a meantes, constituting the third and fourth these have since been removed into the first two orders, which now embrace the entire class, and are denominated 1 reptilia, reptiles, 2 serpentes, serpents of which the first have feet, and flat naked ears without auricles, the last have no feet, eggs connected in a chain, penis double, and muric etc.

These last are cast upon the earth naked, without limbs, exposed to every injury, but frequently armed with a mortal venom, contained in tubular fangs resembling teeth, placed without the upper jaw, protruded, or retracted at pleasure, and surrounded with a glandular vesicle, by which this fatal fluid is secreted. But lest this tribe should too much enervate upon the limits of other animal life, the benevolent Author of nature has armed about a fifth part only of it in this deadly manner, while in order to inspire other animals with a suspicion sufficiently extensive, he has ordained that all of them should cast their skins as a mark of the class to which they belong. The jaws are dilatable and not articulate, and the oesophagus so long that they can swallow, without mastication, in animal twice or thrice as large as the neck of the deglutient serpent the colour is variable, and changes according to season, age, or mode of living, and frequently converts to another in the dead body tongue filiform, bifid, skin reticulate. The species under these respective orders are as follows.

### 1 Reptilia, Reptiles, or possessing feet

1 Testudo, tortoise body four-footed, covered with a shell, 2 draco, flying dragon body four-footed, tailed and winged, 3 lacerta, lizard or crocodile body (mostly) four-footed, tailed, naked, 4 rana, frog, toad body five-footed, naked, tailless, 5 siren, siren body two footed, tailed, naked.

### II Serpentes, serpents, or footless

1 Corollus, rattle snake plates on the belly and tail, with a rattle. 2 Boa, horn plates on the belly and tail, without a rattle. 3 Coluber viper plates on the belly scales on the tail. 4 Anguis, snake scales on the belly and tail. 5 Amphibina rings on the belly and tail. 6 C. cina body with naked

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lateral wrinkles 7 Acrochordus body covered with warty tubercles.

For a more particular description of these genera, see the genera themselves, TESTUDO, DRACO, LACERTA, &c.

**AMPHIBIOLOGY** (from ἀμφίβια, amphibia, and λόγος, a discourse or treatise) The doctrine or science of amphibious animals, as ornithology is the doctrine or science of birds, and ichthyology that of fishes.

**AMPHIBIOLITHUS** In oryctology, a genus of the class petrefactions consisting of the body or some other part of an amphibious animal changed into a fossil substance. The most common species yet discovered are 1 a testudinis, petrified tortoise, found entire, or in parts, sometimes in the stone quarries of Oxfordshire, in a bed of schist in Switzerland, or St. Peter's Mountain, near Mies-tricht in Brabant, near Burlington in Switzerland, in Malta, in Leipsic, or other parts of Saxony, 2 a ranae petrified toad, the head found in a bed of schist in Switzerland, and an entire figure in a schistous wine stone at Oeningen, 3 a crocodile, petrified crocodile, found near Linton in Gloucestershire, in indurated clay, near Drax in Aquisgranum, at the depth of fifty yards beneath the surface of the earth, and in various other places.

**AMPHIBIOUS (AMPHIBIA, which see)** A term applied to animals which live both on land, and in the water, that is, which breathe the air, but pass part of their time in the water, as affording them their chief food. Such are the frog, castor, otter, tortoise, sea calf, crocodile, &c. Most of the amphibious kind, the castor and otter excepted, have peculiar provisions in their structure, to fit them for so various a way of living, particularly in the heart, lungs, foramen ovale, &c.

The term amphibious is sometimes also extended to men, who have the faculty of living a long time under water.

We have divers instances of such amphibious men, the most remarkable is of a Sicilian, named the Fish-Colic. Kircher relates, that by a long habitude from his youth, he had so accustomed himself to live in water, that his nature seemed to be quite altered, so that he lived rather after the manner of a fish than a man. A Calabrian monk at Madrid laid claim to this kind of amphibious capacity, making an offer to the king of Spain to continue twice twenty four hours under water, without ever coming up to take breath.

**AMPHIBIOUSNESS** (from amphibious) The quality of being able to live in different elements.

**AMPHIBIOSTROIDS** (from ἀμφιβροστειν, a net, and στρον, similar) The retina, or net-like coat of the eye. Reticulate.

**AMPHIBIOLOGICAL** a (from amphibiology) Doubtful.

**AMPHIBIOLOGICALLY** ad (from amphibiological) Doubtful.

**AMPHIBIOLOGY, or AMPHIBOLIA**, in grammar, a fault in language, whereby it is rendered obscure, and liable to be understood

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in a double sense The word comes from *αμφίβολος*, *ambiguous*, and *λόγος*, *discourse* Amphibology is chiefly used in respect of a phrase, as equivocal is in respect of a word

**AMPHIBOLOUS** *a* (*ἀμφί* and *βαλλω*) Tossed from one to another, striking each way (*Howel*)

**AMPHIBRACHYS**, in ancient poetry, the name of a foot consisting of three syllables, whereof that in the middle is long, and the other two short, such is the word *ibire*

**AMPHICTYONS**, in Grecian antiquity, an assembly composed of deputies from the different states of Greece, and resembling, in some measure, the diet of the German empire. They decided all public differences and disputes between any of the cities of Greece, but before they entered on business, they jointly sacrificed an ox cut into small pieces, as a symbol of their union. Their determinations were received with the greatest veneration, and even held sacred and inviolable. The stated terms of their meeting were in spring and autumn, the spring was called *Εσρινή Πύλαια*, that in autumn *Μεσοπωρινή*. On extraordinary occasions, however, they met at any time of the year, or even continued sitting all the year round. Philip of Macedon usurped the right of presiding in the assembly of the Amphictyons, and of first consulting the oracle which was called *Πισιαία*

**AMPHICTYONIC FAIRS**, occurred twice in the lapse of twelve months. These fairs arose in consequence of the assemblies of the states general. Multitudes of people were drawn together at Delphi in the spring, or at Thermopylae where the second sittings were held in autumn. It was impossible, says De Pauw, for the Greeks to meet in any place, either whatever pretext, without some commercial transactions. Dion Chrysostom accuses the Amphictyonic fairs of being in infamous traffic of slaves, destined for public incontinence, and the charge has not been entirely refuted. Still, however, the autumnal fair at Thermopylae displayed, likewise, abundance of medicinal herbs and roots, collected on the brow of Oeta, the chief of these was hellebore, which the Greeks employed almost universally against disorders of both body and mind.

**AMPHIDROMIA** a festival observed by private families at Athens, the fifth day after the birth of every child. It was customary to run round the fire with a child in their arms, whence the name of the festival.

**AMPHILOCHIUS**, son of Amphiraus and Eriphyle, was a celebrated diviner. He had an altar erected to him at Athens, and an oracle at Mallus in Cilicia, which city was founded by him and Mopsus. The answers of this oracle were given by dreams. The party enquiring used to pass a night in the temple, and that night's dream was the answer. Dion Cassius mentions a picture done by order of Severus Cæsar, representing the answer he received of the oracle, in the reign of the emperor Commodus.

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**AMPHIMACER**, in ancient poetry, a foot consisting of three syllables, whereof the first and last are long, and that in the middle short, such is the word *castitas*

**AMPHION**, in fabulous history, the son of Jupiter and Antiope. He played so well on the lyre, that the rocks were said to follow him, and the stones moved by his harmony, ranged themselves in order, and formed the walls of Thebes. He married Niobe, whose insult to Diana occasioned the loss of their children; when the unhappy father, filled with despair, attempted to destroy the temple of Apollo, but was punished by the loss of his sight and skill, and cast into the infernal regions.

The fable of Amphion's moving stones and raising the walls of Thebes by his harmony, has been explained by supposing that he persuaded, by his eloquence, a wild and uncivilized people to unite together and build a town to protect themselves against the attacks of their enemies.

**AMPHION**, in entomology, a species of *HESPERIA*, which see.

**AMPHIPOLES**, in antiquity, the principal magistrates of Syracuse. They were established by Timoleon in the 109th Olympiad, after the expulsion of the tyrant Dionysius. They governed Syracuse for the space of 300 years, and Diodorus Siculus assures us, that they subsisted in his time.

**AMPHIPOLIS**, now called Christopolis, a city of Macedonia, in European Turkey. It was built by Cymon, the famous Athenian, about 470 years before Christ, and peopled with a colon of his countrymen. Lat 41 38 E Long 24 16 F.

**AMPHIPPI**, in antiquity, those who practised riding on two horses, by jumping from one to the other.

**AMPHIPROSTYLE**, a temple which had four columns in front, and as many in the aspect behind.

**AMPHISBÆNA** In zoology, a genus of the Linnæan class amphibia, order serpentes. The following is its generic character: rings on the body and tail, no scales, the body smooth, equal, cylindric, the tail scarcely distinguishable from the head, and very obtuse. From this muscular similarity of the head and tail, and their equal power of seizing and compressing its prey, this genus derives its name, viz *αμφί, circiter, utrinque*, and *σέβηνα, comprimator*.

The *amphisbæna* comprises five species, all of them natives of America. 1 a *fuliginosa*, 2 a *varia*, 3 a *magnifica*, 4 a *flava*, 5 a *alba*. This last has two varieties, it frequents ant-hills, from its fondness of these animals, for its food. With its little obtuse snout it digs a hole in these situations, and buries itself from sight. See Nat Hist pl II III.

**AMPHISCII**, among geographers, a name applied to the people who inhabit the torrid zone. The *amphiscii*, as the word imports, have their shadows one part of the year towards the north, and the other towards the south. They are also called *Ascii*.

## A M P

**AMPHITAPÆ**, in antiquity, a kind of earpets, or clothing, having a soft warm knap on each side

**AMPHITHEATRE**, in antiquity, a spacious edifice, with a number of rising seats, from whence the people used to behold the combats of gladiators, of wild beasts, and other sports Amphitheatres were at first only of wood, and it was not till the reign of Augustus, that Statilius Taurus built one of stone The lowest part was of an oval figure, and called arena, because, for the convenience of the combatants, it was usually strewed with sand, and round the arena were vaults styled caveæ, in which were confined the wild beasts appointed for the shows Above the caveæ was erected a large circular peristyle, or podium, adorned with columns This was the place of the emperors, senators, and other persons of distinction The rows of benches were above the podium Their figure was circular, and they were entered by arcues, at the end of which were gates called vomitorie The theatre was built in form of a semicircle, only exceeding a just semicircle by one-fourth part of the diameter, and the amphitheatre was nothing else than a double theatre, or two theatres joined together so that the longest diameter of the amphitheatre was to the shortest as one and a half to one

There are amphitheatres still standing at Rome, Pola, &c That of Vespasian, and that at Verona, are the most celebrated now remaining It is computed that the amphitheatre of Vespasian would hold 67,000 spectators

**AMPHITRION**, in entomology, a species of PAPILIO, which see

**AMPHITRITE** In zoology, a genus of the class and order VERMES mollusca thus characterised, body projecting from a tube and annulate, peduncles or feet small, numerous, feelers two, approximate, feathered, eyeless Seven species, some of cold, others of hot climates A reniformis, and auricoma, are beautiful worms The former inhabits the seas about Iceland, with a bright scarlet body, about three inches long, the latter the Atlantic, Indian, and South Seas, with a steel-blue trunk, very smooth, and fourteen tufts of gold bristles, each side at the margin, three or four in each

**AMPHODONTA** (compounded of *amphi* and *δόντις*, *teeth*) In zoology, a designation given to animals which have teeth in both jaws

**AMPHORA**, in antiquity, a liquid measure among the Greeks and Romans The Roman amphora contained about seven gallons and an eighth of our wine measure the Grecian or Attic amphora about nine gallons and a half Amphora was also a dry measure used by the Romans, holding about three bushels Among the Venetians, amphora is the largest liquid measure, and holds about four gallons

**AMPHORA**, in astronomy, the constellation *Aquarius*

**AMPHORARIUM VINUM**, in antiquity, denotes that which is drawn or poured into am-

## A M P

phoræ, or pitchers, by way of distinction from vinum dolare, or cask wine

**AMPHOTIDÆ**, armour for the ears, used by the ancient pugiles

**AMPLA**, in conchology, a species of voluta Shell elongated, aperture large, lip acute, wreaths of the spire scarcely visible

**AMPLA** *a* (*amplus* Latin) 1 Large, wide extended (*Thomson*) 2 Great bulk (*Shakspeare*) 3 Unlimited, without restriction (*Dryden*) 4 Liberal, large, without parsimony (*Hooker*) 5 Magnificent splendid (*Clarendon*) 6 Diffusive, not contracted

**AMPLIFFES** *s* (from *ample*) Largeness splendour (*South*)

**AMPLEXAUIFOLIUM**, a stem-climbing leaf, embracing, clasping or surrounding the stem by its base Some leaves only half round, these are called semianplexicaulia

**AMPLIATE** *v a* To enlarge, to make the greater to extend (*Brown*)

**AMPLIATION** *s* (from *amplare*) 1 Enlargement, exaggeration (*Ayliffe*) 2 Diffuseness, enlargement (*Holder*)

**AMPLIATION**, in Roman antiquity, the deferring to pass sentence in dubious causes, which the judge did by pronouncing the word *amplius*

**AMPLIFICARE** *v a* (*amplifico*, Lat) To enlarge, to amplify

**AMPLIFICATION** *s* (*amplification*, Fr) 1 Enlargement extension 2 Exaggerated representation (*Pope*)

**AMPLIFICATION**, in rhetoric, part of a discourse or speech, wherein a crime is aggravated, a praise or commendation heightened, or a narration enlarged, by an enumeration of circumstances, so as to excite the proper emotions in the souls of the auditors Such is the passage in Virgil, where instead of saying merely that Turnus died, he amplifies the circumstances of his death

—*At illi solvuntur frigore membra,  
Vitæque cum gemitu fugit indignata sub umbras*

The masters of eloquence make amplification to be the soul of discourse Longinus speaks of it as one of the principal means which contribute to the sublime, but he censures those who define it a discourse which magnifies things, thus equally agreeing to the sublime, the pathetic, &c

**AMPLIFIER** *s* (from *to amplify*) One that exaggerates (*Sidney*)

**AMPLIFY** *v a* (*amplifier*, Fr) 1 To enlarge (*Bacon*) 2 To exaggerate any thing (*Davies*) 3 To improve by new additions (*Watts*)

**AMPLIFY** *v n* 1 To lay one's self out in diffusion (*Watts*) 2 To form pompous representations (*Pope*)

**AMPLITUDE** *s* (*amplitude*, Fr) 1 Extent (*Glanville*) 2 Largeness, greatness (*Bacon*) 3 Capacity (*Milton*) 4 Splendour, grandeur (*Bacon*) 5 Copiousness, abundance (*Watts*)

## A M S

**AMPLITUDE**, in astronomy, an arch of the horizon intercepted between the east or west point and the centre of the sun, or a planet, at its rising or setting, and so is either north and south, or ortive and occasive. The amplitude of a heavenly body may be found trigonometrically by saying, as the cosine of the latitude, to radius, so is, the sine of the declination of the body, to the sine of its amplitude. O Gregory's Astron p 81

**Magnetical Amplitude**, is an arch of the horizon contained between the centre of the celestial body when rising or setting, and the east or west point of the compass. It is always equal to the difference between the true amplitude and the variation of the compass.

**AMPLY** *ad* (*amplē*, Fr) 1 Largely, liberally (*Atterbury*) 2 At large, without reserve (*Milton*) 3 Copiously, with a diffusive detail (*Dryden*)

**AMPTHILL**, a town of Bedfordshire, with a market on Thursdays. Lat 52 6 N Long 0 30 W

**AMPULLA** (*αμβόλλα*, from *αμφιβάλλω*, to well out) A vessel, either animal or chemical, that bellics out like a bottle or jug.

**AMPULLA**, in antiquity, a round big bellied vessel, used for various purposes, as to contain oil for consecration, anointing, brushing, &c.

**AMPULLULÆ** (dimin of *ampulla*) In anatomy, the bases or bulbous extremities of the lacteals. The villi of the intestines resemble in appearance piles of velvet each villus is about fifteen absorbent orifices, and about a hundred of them converge to form the bulbous end, or impullus of every lacteal trunk.

**AMPURIAS**, a sea port town of Catalonia, in Spain, 60 miles N E. of Barcelona. Lat 42 5 N Long 3 6 E.

**TO AMPUTATE** *v a* (*amputo*, Lat) To cut off a limb (*Weseman*)

**AMPUTATION** (*amputatio*, from *amputo*, to cut off) A surgical operation, which consists in the removal of a limb or viscus, thus we say a leg a finger, when cut off, is amputated, but when speaking of a tumor, or excrescence, it is said to be dissected or removed.

**AMRAS**, a strong castle of Germany, on the river Tirol, full of rarities of every kind. It has a library with the portraits of many learned men. Lat 47 9 N Long 11 20 E.

**AMSTERDAMS**, in antiquity, those whose grounds abutted on the highway.

**AMSTERDAM**, the capital of Holland, and of all the United Dutch States, is situated on the river Amstel at its conflux with the river Ye or Wye, which forms a port capable of receiving a thousand large vessels, about two leagues from the Zuyder sea. It takes its name from Amstel and Dim, being as it were the dam or dike of the Amstel. In the beginning of the thirteenth century, it was the residence only of a few fishermen, but soon after growing populous the girls of Holland gave it the title and privileges of a city, and in the year 1490 it was surrounded by a wall of brick, by order of Ma<sup>o</sup> of Burgundy, to defend it from

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the incursions of the inhabitants of Utrecht, who had quarrelled with the Hollanders. It has been frequently enlarged, particularly in the years 1593, 1595, 1601, 1612, 1650, and 1675, at which last date it was extended to its present size, and surrounded by a wall and a large ditch, eighty feet wide, full of running water, the walls were fortified with twenty-six bastions, there are eight gates towards the land, and one towards the water. The city at present is supposed to contain 250000 inhabitants, forty-four leagues from Brussels, forty-nine from Liege, and 112 from Paris. Lat 52 23 N Long 4 50 E.

**AMSTFRDAM**, an uninhabited island in the Frozen sea, near the west coast of Spitzbergen.

**AMSTERDAM**, an island in the Indian sea. Lat 37 55 S Long 75 17 E.

**AMSTERDAM, or TONGATABOO**, an island in the South Pacific ocean. Lat 21 9 S Long 174 46 W.

**AMTRUSTIO**, in old charters, a liege tenant of the ancient French or German kings.

**AMULET**, **AMULETUM**, a kind of external medicament, to be worn about the neck, or other part of the body, to prevent, or remove, diseases. The word amulet is formed from *αμυνω*, to protect. Such are quills of quicksilver, or arsenic, which some hung on the neck or wear under the shirt, against the plague, and other contagious diseases, as also the blood-stones worn by others against hemorrhages, and that worn by the women of the East Indies to bring the menses. Amulets are also frequently no other than a sort of spells or charms, consisting of quaint words and characters, supposed to have the virtue of warding off ill. Pliny makes frequent mention of them.

**AMUND** anciently a person freed from wardship.

**AMURLA**, in pharmacy, a medicine made of the refuse or recement of expressed olives.

**TO AMUSE** *v a* (*amuso*, Fr) 1 To entertain with tranquillity (*Walsh*) 2 To draw on from time to time.

**AMUSEMENT** *s* (*amusement*, Fr) That which amuses, entertainment (*Roopers*)

**AMUSLR** *s* (*amuseur*, Fr) He that amuses.

**AMUSIVE** *a* (from *amuse*) That has the power of amusing (*Thomson*)

**AMUTICA**, **AMUTICS** (*αμυτική*, from *αμυνω*, to scratch) Medicines, that by velleitating or scratching is it were the bronchii, stimulate it to the discharge of whatever is to be thrown off the lungs.

**AMYCTICÆ**, **AMYCTICS** (from *αμυνω*) The same as **AMUTICS**, which see.

**AMYGDALA** (*amygdala*, *αμυγδαλον*, from *αμυνω*, to lanceolate, so called because after the green husk is removed from the fruit, there appear upon the shell certain fissures, as it were lacerations) Almonds, the kernels of the fruit of the almond tree, amygdalus communis of Linnæus. Classicosindria, order monogynia. A native of Greece. The same tree produces either bitter or sweet almonds.

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Sweet almonds are more in use as food than medicine. They afford, on expression, a great proportion of oil, which, from being more agreeable to the palate than the other oils, is preferred for internal use, to soften and relax the solids, in tickling coughs, hoarseness, costiveness, nephritic pains, &c. Externally it is used in tensions and rigidities of particular parts. An emulsion of sweet almonds possesses the emollient qualities of the oil. See **AMYGDALUS**.

**AMYGDALA**. The almonds of the ears. See **TONSILS**.

**AMYGDALÆ AMARÆ**. See **AMYGDALA**.

**AMYGDALÆ DULCES**. See **AMYGDALA**.

**AMYGDALINE** *a* (*amygdala*, Lat.) Resembling almonds.

**AMYGDALITIS**. Almond-stone. A genus of the class carths, order aggregate, consisting of various rounded or elliptical stones of different sizes, imbedded together, and forming an irregular mass, occurring principally in mountains of a later date, and generally mouldering when exposed to the air. Fifty-five species, which may be subdivided into those, A, with a siliceous base, B with a calcareous base, C, with an argillaceous base, D, with a siliceous base. The subdivision C is by far the most numerous, and in this is to be arranged the *a* vulgaris, amygdaloid, or common almond-stone, composed of trap and spar, found in Derbyshire, and other parts of Britain; in Italy, Saxony, Bohemia, Hungary, &c. in stratified mountains, and is often the matrix of agate and chalcidony. The spar is always white, with sometimes a coating of green alumine; the glaudules are larger or less, and more or less thickly dispersed through the mass, which is red, brown, grey, or black. There is likewise often an admixture of mica, green alumine, or feldspar.

**AMYGDALUS**. Almond-tree. A genus of the class and order icosaandria monogynia. Calyx inferior, five-clift; petals five; drupe with a nut perforated by pores. There are seven species in different parts of Europe, Asia, and Africa, of which the following are chiefly entitled to notice: 1. *a* Persica, with a downy skin, peach; 2. *a* Persica, with a glabrous skin in maturity, both the varieties, as their specific name imports, are natives of Persia; 3. *a* communis, common almond, which includes both the sweet and the bitter almond trees, and are natives of Greece.

**AMYGDALUS COMMUNIS**. The systematic name of the plant which affords both sweet and bitter almonds. See **AMYGDALA**.

**AMYGDALUS PERSICA**. The systematic name of the common plum tree. See **AMYGDALUS**.

**AMYLA** (from *amylum*, starch) Any sort of chemical feculence, or finely pulverised residuum.

**AMYLEON**, **AMY'LION**. See **AMYLUM**.

**AMYLON**, in old writers, an aliment, it is supposed to be much like our firmity.

## A N A

**AMYLUM** (*amylum*, *αμυλον*, from *a priv* and *μύλη, a mill*, because it was formerly made from wheat without the assistance of a mill.) Starch. The white substance which subsides from the water that is mixed with wheaten flour. The starch-manufacturers suffer it to remain in the water for a time, after it has become acid, which makes it very white and soft to the touch, and scarcely sensible to the taste. Starch is frequently employed medicinally in clysters against diarrhoeas. Externally surgeons apply it as an absorbent in erysipelas.

**AMYNŦA**, in literary history, a beautiful pastoral comedy, composed by Iasso, the model of all dramatic pieces where the players are actors. The Pastor Fido, and Filly di Sciro, are only copies of this excellent piece.

**AMYNŦOR**, *αμυντορ*, formed of the verb *αμυνω, I defend* or *avenger*, properly denotes a person who defends or vindicates a cause. In this sense, Mr. Toland entitles his defence of Milton's life, *amynŦor*, as being a vindication of that work against Mr. Bickhall and others.

**AMYRAIDISM**, a name given by some writers to the doctrine of universal grace, as explained and asserted by Amvaidus, or Moses Amyraut, and others his followers, among the reformed in France, towards the middle of the seventeenth century.

**AMYRIS**. In botany, a genus of the class and order octandria monogynia. Calyx four-toothed, petals four, oblong, stigma four-sided, berry drupaceous. Nineteen species have been collected in Asia, Africa, and America, almost all of which produce a considerable quantity of terebinthine resin or balsam, and several of them of a very grateful taste or flavour. The following are chiefly worthy of notice: 1. *a* elemifera, yielding the oil of gum-clemai; 2. *a* galidensis, balsam of Galicid-tree; balsam of Mecca or Turkey-tree, so called from its yielding this gum; 3. *a* toxicaria, poison ash, yielding a liquid gum is black as ink; 4. *a* balsamifera, rose-wood, in elegant and odiferous Jamaica tree, of little much and deservedly esteemed by our cabinet-makers. A toxicaria though poisonous to animals in general, affords a fruit that is nutritive to one or two species of the lous or grosbeak, which feed on it with great glee.

**AN article** (*we, Saxen*) 1. One, but with less emphasis, as, in ox. *o* Any, or some, as, an elephant might swim in this water.

**ANA** (*ana*) In medicinal prescriptions, means *of each*, and is generally contracted into *aa*, or *ā*.

**ANAS**, in matters of literature, a Latin termination adopted into the titles of several books in other languages. *Anas* or books in *ana*, are collections of the memorable sayings of persons of learning and wit, much the same with what we otherwise call table-talk. Wolfius has given the history of books in *ana*, in the prefix to the *Casauboniana*.



ANABAPTISM See ANABAPTISTS,  
INFRA  
ANABAPTISTON See ABAPTIS-  
TON

ANABAPTISTS, a name given to Christians, who maintain that baptism ought always to be performed by immersion, that it ought not to be administered to children before the age of discretion, or that at this age it ought to be re-administered to those who have been baptized in their infancy because, they say, the administration of this sacrament is neither valid nor useful, if it be done by sprinkling only, and not by immersion, or if the persons who receive it be not in a condition to give the reasons of their belief

The word *anabaptist* is compounded of *ana*, again, and *baptizō*, to baptize, and this general denomination has been indiscriminately applied to persons of very different principles and practices, though many of them object justly to the name, and hold nothing in common, excepting some or other of the abovementioned opinions concerning baptism

The Novatians, the Cataphrygians, and the Donatists, may be considered as a kind of anabaptists in the earlier ages, though not then denoted by this name, for they contended, that those Christians of the catholic church, who joined themselves to their respective parties, should be re-baptized. But we must not class under the same denomination those bishops of Asia and Africa, who, in the third century, maintained, that baptism, administered by those whom they called heretics, was not valid, and therefore that such of them as returned into their churches ought to be re-baptized. Nor do the English and Dutch Baptists consider the denomination as at all applicable to their sect by whom the baptism appointed by Christ is held to be "nothing short of immersion, upon a personal profession of faith, of which profession infants being incapable, and sprinkling being no adequate symbol of the thing intended, the baptizing of proselytes to their communion, who in their infancy had undergone the ceremony of sprinkling, cannot, it is urged, be interpreted a repetition of the baptismal ordinance

Anabaptists, in a strict and proper sense, appear to be those who not only re-baptize, when they arrive at an adult age, persons that were baptized in their infancy, but also, as often as any person comes from one of their sects to another, or as often as any one is excluded from their communion and again received into the bosom of their church, they baptize him. And such were many of the German Baptists. But the single opinion common to all the sects to which the name of Anabaptist has been indiscriminately applied, is that of the invalidity of infant baptism, in whatever way administered. And hence the general denomination of Antipedobaptists, which includes Anabaptist, Baptists, Mennonites, Waterlanders &c. as distinguished by their respective principles

The term Anabaptists was first applied to a protestant sect which sprung up in Germany immediately after the Reformation. It was founded in the year 1521, by Nicholas Störck, Mark Stubner, and Thomas Muncer, who had been followers of Luther, but abandoned him on pretence that his doctrine was imperfect. Störck being a man of no learning, boasted of inspirations, Stubner, who had wit and some learning, applied himself to find out suitable explanations of the word of God, and Muncer, who was bold and zealous, played the enthusiast in the most extravagant manner

The most prominent of their religious tenets related to the sacrament of baptism, which, as they contended, ought to be administered only to persons grown up to years of understanding, and should be performed not by sprinkling them with water, but by dipping them in it for this reason they condemned the baptism of infants, and baptizing all whom they admitted into their society, the sect came to be distinguished by the name of Anabaptists. To this peculiar opinion concerning baptism, which certainly appears founded on the practice of the church in the apostolic age, and contains nothing inconsistent with the peace and order of human society they added other principles of a most enthusiastic as well as dangerous nature. They maintained, that among Christians, who had the precepts of the gospel to direct, and the spirit of God to guide them, the office of magistracy was not only unnecessary, but an unlawful encroachment on their spiritual liberty, that the distinctions occasioned by birth, or rank, or wealth, being contrary to the spirit of the gospel, which considers all men as equal, should be entirely abolished, that all Christians, throwing their possessions into one common stock, should live together in that state of equality which becomes members of the same family, that is neither the laws of nature, nor the precepts of the New Testament, had placed any restraint upon men with regard to the number of wives which they might marry, they should use that liberty which God himself had granted to the patriarchs

By these doctrines they soon drew over vast numbers to their side, in so much that Muncer ventured openly to exhort the people to resist the magistrates, and constrain princes to divest themselves of their authority. This, as might naturally be expected, produced considerable tumults and insurrections, and particularly in the bishopric of Munster, where a civil war was carried on for a long period. The sect became very prevalent in Munster, where Bockold their leader, who had acquired great ascendancy over the multitude, set up a dominion under the title of the kingdom of the Anabaptists. The monarch, however, was at length taken and put to death by torture, with him ended the kingdom. All who are at all acquainted with the peculiar tenets which distinguish the different sects in Great Britain, must be perfectly aware that those among us

## ANA

who are advocates for the baptism of adults and by immersion, hold in abhorrence the wildly enthusiastic and dangerous sentiments of Storck and Muncie surely then it would be no great stretch of liberality and candour, to relinquish the application of the term Anabaptist to them, a term which indirectly reproaches them with speculations and practices upon which no Christians can look with greater detestation than the majority of modern Baptists See **BAPTISTS**

**ANABASII**, in antiquity, couriers who travelled in horses or in chariots, with important dispatches

**ANABASIS** Berry bearing glass-wort A genus of the class and order pentandria digynia Calyx three-leaved, corol five petalled, berry one-seeded, surrounded by the calyx There are five species, chiefly in Siberia and on the Caspian shores

**ANABASIS** (from *αναβαινω*, to ascend) An increase or augmentation of a disease or paroxysm

**ANABATHRA**, an ancient contrivance, similar to what we now call a horseblock In a general sense it denoted steps by which persons ascended any eminence

**ANABEΛΙΣ** (*ανελε*, from *αναβημι*, to cough up) An extension or expectoration of mucus by coughing

**ANABOA** a small island on the coast of Loango in Africa Lat 1° N Long 8° 30' E

**ANABOLÆUM**, in antiquity, a kind of upper coat

**ANABOLFUS** in antiquity, an enquiry

**ANACALYPTERIA**, according to Suid is presents made to a bride by her husband's friends, when she first appeared publicly before men

**ANACAMPICK** a (*ανακαμπω*) Reflecting, or reflected

**ANACAMPICKS** s The doctrine of reflected light catoptricks

**ANACAMPTOS**, a term used by the ancient Greeks to signify a course of retrograde or reflected notes Anacamptic notes were also those which proceeded downwards, or from acute to grave Anacamptos, taken in this sense, was the contrary of euthia

**ANACARDIUM** Cashew-nut, or acjou A genus of the class and order eucandria monogynia Calyx five parted, petals five, reflected, anthers nine, with a tenth barren one, nut kidney-shaped, seated on a fleshy receptacle There is but one species known, which is a native tree of India, and entitled a occidentale It grows naturally to the height of twenty feet, and bears a fruit about the size of an orange, filled with a pleasant acid juice, often employed in making punch The nut of the plant grows at the apex of the fruit, the oil of which is an active caustic, and employed as such in its native country, but neither it, nor any part of the fruit, is used medicinally in this country

**ANACARDIUM ORIENTALE** Malacca bean The fruit or nut so called in old phar-

## ANA

macopias is of a shining black colour, heart-shaped, compressed, and about the size of the thumb nail It is the produce of a different plant from the systematic *macardium*, but is of no medicinal efficacy, and now deservedly forgotten in this country

**ANACATHARSIS** (*anacatharsis*, *ανακαθαρσις*, from *ανα* and *καθαρισμα*, to purge up) An expectoration of mucus or pus

**ANACATHARTICS** (from *anacatharsis*) Medicines which promote expectoration or the excretion of humours from the lungs or bronchia

**ANACHTIA**, an Athenian festival in honour of the Dioscuri

**ANACEPHALTOSIS**, in rhetoric, a recapitulation of the heads of a discourse

**ANACHARSIS**, a Scythian philosopher, travelled to Athens in the time of Solon, by whom he was greatly esteemed He was the only stranger the Athenians ever admitted to the honour of citizenship Croesus invited him to Sardis, with the offer of riches, but he replied, "that he came to Greece for improvement, and not for money" After a long stay in Greece, he returned to Scythia, where he attempted to introduce the customs and institutions of Greece, which brought upon him the enmity of his countrymen Goug one day into a wood, to perform a sacred rite to the goddess Cybele, he was shot with an arrow by the king himself Many of his apophthegms are preserved by Lælius, who wrote his life, by Plutarch and others An Athenian once reproaching him with being a Scythian "True," says Anacharsis, "my country is a disgrace to me, but you are a disgrace to your country" He flourished about 592 years before the Christian era

**ANACHORET**, **ANACHORITE** s (*αναχωρητης*) A monk who leaves the convent for a more austere and solitary life

**ANACHORITA**, in ecclesiastical writers, a name sometimes given to the cells of recluses By the ancient canons, no anachorita could be erected without consent of the bishop

**ANACHIRONISM**, in chronology, an error in computation of time, whereby an event is placed earlier than it really happened When a fact is placed lower and later than it should be the error is called a parachironism

**ANACLASTIC CURVE**, the same as **CURVE REFLECTOIRE**, which see

**ANACLASTIC GLASSES**, a kind of sonorous phials or glasses, chiefly made in Germany, which have the property of being flexible, and emitting a vehement noise by the human breath The glasses are a low kind of phials with flat bellies, resembling inverted funnels, whose bottoms are very thin, scarce surpassing the thickness of an onion peel This bottom is not quite flat, but a little convex, but upon applying the mouth to the orifice, and gently inspiring, or as it were sucking out the air, the bottom gives way with a prodigious crack, and from convex becomes concave On the contrary, upon expiring or

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breathing gently into the orifice of the same glass, the bottom with no less noise bounds back to its former place, and becomes glibbous as before.

**ANACLASTICS**, the same as **DIOPTRICS**.

**ANACLETICUM**, a solemn festival celebrated by the ancients, when their kings assumed the reins of government.

**ANACLLIICUM**, anciently, a rallying blast of a trumpet, to rec'd the flying soldiers.

**ANACLINOPALE**, in antiquity, a strange kind of wrestling, in which the weaker was sometimes victorious.

**ANACINTERIA**, in antiquity, a kind of pillows on the dying bed, whereon the guests leaned.

**ANACREMPIS** (from *ανακρεμπωμαι*, to hawk up) Expectoration.

**ANACREON**, a Greek lyric poet, was born at Teos in Ionia, about the sixth century B.C. He was entertained at the court of Polycrates at Samos, who held him in great esteem. At the invitation of Hipparchus, son of Pisistratus, he visited Athens, and on the death of that prince, he returned to Teos, and remained there till the revolt of Hiestu, when he removed to Abdera; where he was choaked, while drinking, by a grape-stone, at the age of 87, after a life of much dissipation and intemperance. His statue was placed in the citadel of Athens, representing him in an old drunken man revelling. He was shamefully attached to a youth called Bathyllus. His poems are amatory and buchanian, but only few of them remain. The best editions of Anacreon are those of Barne, Paris, and the splendid ones of Spalletti in 1781 and 1783. An elegant translation of Anacreon into English was published by Francis Fawles, A.M. His odes are pretty well characterized by Cowley, when he says, in the character of Cupid,

“All thy verse is softer far  
Than the downy feathers are  
Of my wings, or of my arrows,  
Of my mother's doves and sparrows  
Graceful, cleanly, smooth or round  
All with Venus girdle bound

A translation of these odes was published in 1801, by Thomas Moore, esq.

**ANACREONTIC** This derivative from the name of Anacreon, is sometimes placed at the beginning of convivial songs, glees, and festive odes, especially when they include the celebration of the grape, and denotes a givilarity of movement, and a free and easy style of performance.

**ANACREONTIC VERSE**, in ancient poetry, a kind of verse, so called from its being much used by the poet Anacreon. It consists of three feet and a half, usually spondee and iambic, and sometimes anapest, such is that of Horace, *Lydia, hic per omnes*.

**ANACRISIS**, a kind of examination, which the Athenian archons went through before their admission into office.

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**ANACROSIS**, in antiquity, the first part of the Pythian song.

**ANACIRON** Natron, or soda. See **ANATRON**.

**ANACYCLUS** In botany, a genus of the class and order syngenesia polygamia superflua. Receptacle chaffy, seeds crowned with an marginal margin, those of the ray membranaceous at the sides. It embraces five species, all of which are natives of the Mediterranean in shores.

**ANADEMA**, a head ornament wherewith victor, at the ancient games, were decorated.

**ANADIPIOSIS** *s* (*αναδιπλωξις*) Reduplication, a figure in rhetoric, in which the last word of a line or clause is repeated in the beginning of the next. Thus the apostle,

If children, then heirs, heirs of God, &c.

**ANADIR**, a considerable river of Siberia, that falls into the Eastern ocean.

**ANADYSIS**, among ancient divines, denotes the omission in baptism.

**ANADIDIA**, in antiquity, a silver stool placed in the neopagus, on which the person accused was cited for examination.

**ANALNOMA** (from *αναλωμαι*, to refuse) In medicine, a refusal or inability in any member of the body to perform its function.

**ANASTHESIA** (*αναισθησια*, *αναισθησια*, from *α* priv. and *αισθανομαι*, to feel) Loss of the sense of touch. A genus of diseases in the class locales, and order dysaesthesiae of Cullen.

**ANAGALLIS** Pimpernel. A genus of the class and order pentandria monogamia. Corol wheel-shaped, capsule opening universally all round, stamens hairy. It has six species, two of which only are natives of our own country, *a. arvensis* the common pimpernel of the fields, and *a. tenella*, found occasionally in our fens and marshes.

**ANAGLYPIA**, in antiquity, vases adorned with sculpture in basso relievo.

**ANAGLYPHI** (from *αναγλυφω*, to engrave) A part of the fourth ventricle of the brain so called from its resemblance to a pen or style.

**ANAGNOSIS**, or **ANAGNOSMATA** (from *ανα* and *γνωω* *I know*) In the Greek church, denotes an ecclesiastical book, containing the lessons read at divine service in the several feasts, &c. of the year.

**ANAGNOSIA**, in antiquity, a literary servant who read to persons of distinction during their meals.

**ANAGOGETICAL** *a* (*αναγωγικη*) That contributes or relates to spiritual elevation.

**ANAGOGICAL**, signifies mysterious, transporting, and is used to express whatever elevates the mind, not only to the knowledge of divine things, but of divine things in the next life. This word is seldom used, but with regard to the different senses of scripture.

**ANAGOGY**, or **ANAGOGE**, among ecclesiastical writers, the elevation of the mind to things celestial and eternal. It is particularly used where words in their natural or primary meaning denote something sensible, but

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have a further view to something spiritual or invisible

**ANAGRAM** (from *ana*, *backward*, and *γραμμή, letter*) In matters of literature, a transposition of the letters of some name, whereby a new word is formed, either to the advantage or disadvantage of the person or thing to which the name belongs. Thus the anagram of Galenus is angelus, that of Iogica, caligo, that of Alstedius, sedulitas, &c. Calvin, in the title of his Institutions, calls himself Alcuinus, which is the anagram of Calvinus, and the name of an eminently learned person in the time of Charlemagne.

Those who adhere strictly to the definition of an anagram, take no other liberty than that of omitting or retaining the letter h at pleasure, whereas others make no scruple to use e for æ, v for w, s for z, and c for k, and vice versa. But besides anagrams formed as above, we meet with another kind in ancient writers, made by dividing a single word into several, thus, sus tinea mus, are formed out of the word sustineamus. Anagrams are sometimes also made out of several words, such is that on the question put by Pilate to our Saviour, quid est veritas? whereof we have this admirable anagram, vixit qui vixit vixit.

**ANAGRAMMATIST**, a maker or composer of anagrams. Thomas Billon a Provencal, was a celebrated anagrammatist, and retained by Lewis XIII. with a pension of 1000 livres, in quality of anagrammatist to the king.

**ANAGRAMMATIST** *v n* To make anagrams.

**ANAGRAPIF** (αναγραφή, from *ενα* and *γραφή* *to write*) A receipt or precription in medicine.

**ANAGYRIS** Bean trefoil. A genus of the class and order decandria monogynia. Corol papilionaceous, with the standard and wings shorter than the keel, stigma villous, legume oblong roundish many-celled. The only known species is a native of Italy.

**ANALISI SIA** (αναλυσις) **ANALYSIS**, which see.

**ANALISIS** (αναλυσις, from *αναλωσσω*, *to rush* *lack*) In medicine, a return of a disorder or paroxysm.

**ANAL**, the fin which, in fishes, is placed between the vent and tail, and expands perpendicularly.

**ANALICTA**, in antiquity, a servant who gathered up the offals of tables.

**ANALICTA**, is likewise used in a literary sense, for a collection of small pieces or compositions.

**ANALITIMA**, a planisphere, or projection of the sphere, orthographically made on the plane of the meridian, by perpendiculars from every point of that plane, the eye supposed to be at an infinite distance, and in the east or west point of the horizon. In this projection, the solstitial colure, and all its parallels, are projected into concentric circles, equal to the real circles in the sphere, and all circles whose planes pass through the eye, is the horizon and

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its parallels, are projected into right lines equal to their diameters, but all oblique circles are projected into ellipses, having the diameter of the circle for the transverse axis.

This instrument, having the furniture drawn on a plate of wood or brass, with a horizon fitted to it, is used for resolving many astronomical problems, as the time of the sun's rising and setting, the length and hour of the day, &c. It is also useful in dialling for laying down the signs of the zodiac, with the lengths of days, and other matters of furniture, upon dials.

**ANALIPTIK** *a* (αναλπτικ) **Comforting, corroborating** (Quincy).

**ANALIPTICS** (*analeptica, medicamenta, αναλπτικα*, from *αναλαμβάνω*, *to recruit*, *to recruit*) Substances used for food and medicine which are calculated, from their properties, to restore strength when impaired by sickness.

**ANALGESIA** (αναλγησια from *α priv* and *αλγος*, *pain*) Indolence, privation of pain or trouble. The disease called by Hippocrates rithymia, or piresis.

**ANALOGAL** *a* (from *analogous*) Analogous, having relation (*Hale*).

**ANALOGICAL** *a* (from *analogy*) 1 Used by way of analogy (*Watts*) 2 Analogous, having resemblance (*Hale*).

**ANALOGICALLY** *ad* (from *αναλογικα*) In an analogical manner, in an analogous manner (*Cheyne*).

**ANALOGICALNESS** *s* (from *analogical*) The quality of being analogical.

**ANALOGISM** *s* (αναλογισμός) An argument from the cause to the effect.

**ANALOGIZE** *v a* (from *analogy*) To explain by way of analogy (*Cheyne*).

**ANALOGY**, in philosophy, a certain relation and agreement between two or more things which in other respects are entirely different. There is likewise an analogy between beings that have some conformity or resemblance to one another, for example between animals and plants, but the analogy is still stronger between animals of two different species.

Analogy enters into all our reasoning, and serves to explain and illustrate. A great part of our philosophy, indeed, has no other foundation. It is natural to mankind to judge of things less known, by some similitude, real or imaginary, between them and things more familiar or better known. And where the things compared have really a great similitude in their nature, when there is reason to think that they are subject to the same laws, there may be a considerable degree of probability in conclusions drawn from an analogy.

According to professor Crusellon of Berlin, the principal uses of analogy in the investigation of physical and moral truth, may be reduced to these four. 1 By means of our senses to improve, first our own judgment, and afterwards that of others, with respect to intellectual subjects. 2 To deduce a general from a particular truth. Having discovered and proved

the truth of a proposition with respect to any particular object, examine whether this truth flows from a quality peculiar to this single object, or common to several objects. In the latter case all these objects may be comprehended under one general idea, founded on their common quality. Substitute this general idea instead of the particular object, and the proposition will become general, without ceasing to be true, because whatever evidently and solely results from the identity, on which an analogy is founded, must necessarily be true with respect to all those objects in which the analogy is the same. 3 To prove the truth or falsehood of propositions which cannot be otherwise demonstrated. 4 To discover new truths in both natural and moral philosophy.

That analogical reasoning from a supposed similitude of mind to body, which appears to be the most fruitful source of error with regard to the operations of our minds, may be illustrated by the following instance. When a man is urged by contrary motives, those on one hand inciting him to do some action, those on the other to forbear it, he deliberates about it, and at last resolves to do it, or not to do it. The contrary motives are here compared to the weights in the opposite scales of a balance, and there is not perhaps any instance that can be named of a more striking analogy between body and mind. Hence the phrases of weighing motives, of deliberating upon actions, are common to all languages. From this analogy, some philosophers draw very important conclusions. They say, that, as the balance cannot incline to one side more than the other, when the opposite weights are equal, so a man cannot possibly determine himself if the motives on both hands are equal, and as the balance must necessarily turn to that side which has most weight, so the man must necessarily be determined to that hand where the motive is strongest. And on this foundation some of the schoolmen maintained, that if a hungry ass were placed between two bundles of hay equally inviting, the beast must stand still and starve to death, being unable to turn to either, because there are equal motives to both. This is an instance of that analogical reasoning, which, it is conceived, ought never to be trusted, for the analogy between a balance and a man deliberating, though one of the strongest that can be found between matter and mind, is too weak to support any argument. A piece of dead inactive matter, and an active intelligent being, are things very unlike, and because the one would remain at rest in a certain case, it does not follow that the other would be inactive in a case somewhat similar. The argument is no better than this, that, because a dead animal moves only as it is pushed, and, if pushed with equal force in contrary directions, must remain at rest, therefore the same thing must happen to a living animal, for surely the similitude between a dead animal and a living, is as great, as that between a balance and a man.

ANALOGY, among grammarians, is the

correspondence which a word or phrase bears to the genius and received forms of any language.

ANALOGY, in mathematics, the same as proportion, or equality, or similitude of ratios.

ANALYSIS (from *αναλυω*, to resolve) In a general sense, is the resolution of something compounded into its constituent parts, or first elements.

ANALYSIS, in chemistry, the decomposition of a body, or the separation of the constituent parts of a compound substance. Chemistry furnishes several means for the decomposition of bodies. These means are all founded on the differences of the properties belonging to the various principles of which the body to be analysed is composed. Analysis, and synthesis or combination, are the two great processes by which the purposes of the chemistry are accomplished. Analysis is performed either by fire or by menstrua, the first is employed upon bodies whose constituent particles possess different degrees of volatility—the most volatile parts are first separated by a graduated heat, in distilling vessels, and then the parts which are next in volatility will pass over in distillation, while those parts which are fixed, and capable of resisting the action of fire, remain at the bottom of the vessel. The second method of analysis which is far more perfect and correct than the former, and is frequently used to supply its defects, is founded upon the different degrees of solubility which the different particles possess of which the bodies are composed, and of their affinity for each other. This method is of excellent use for separating, without alteration, the proximate principles of many vegetable and animal substances, which the former method is incapable of effecting. Frequently, however, the two methods are used in conjunction.

Analysis, in general, is divided by Fourcroy into two kinds, the true or simple, and the false or complex. The true analysis is that by which the component principles of the body decomposed are obtained, without suffering any alteration. The only criterion by which we can distinguish whether this analysis has taken place, is when, by reuniting the simple substances to which the compound body has been reduced, we can form a new compound precisely similar to the former. Cinnabar will furnish an instance of this, for when the two substances of which it is formed are separated, they are found to be in a state of purity similar to that which they possessed before their separation, and by uniting them, a new body is composed, differing in no respect from the original cinnabar. (See SYNTHESIS.) This kind of analysis, however, can seldom be effected the neutral salts, and a few other mineral substances, are the only bodies in nature susceptible of this species of decomposition. The false or complex analysis is that by means of which a body is resolved into principles different from those which appeared to exist in the composition, and incapable of forming by their reunion, a body similar to that

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from which they were obtained. This kind of decomposition takes place in most of the bodies that are subject to a chemical analysis, no other condition being requisite than that more than two principles enter into the combination to be examined, and that they be united by a certain degree of mutual affinity. Many minerals, and all vegetable and animal substances without exception, admit of no other species of analysis. Thus sugar, distilled in a retort, affords an acid, an oil, and a carbonaceous residue, but all attempts to recombine these into sugar are uniformly fruitless. This kind of analysis cannot enable us to discover in what state substances exist together in any combination before being separated, and it therefore affords but little useful information, and is not to be trusted without the greatest caution. By confiding too hastily in results of this kind, chemists have afforded room for all that censure to which their art has been exposed, and on this account has chemistry been accused of absolutely destroying bodies in its attempts to separate their component parts, but, becoming more circumspect in proportion to her progress, chemistry now rejects that deceitful analysis to which she formerly had recourse, and possesses the means of examining the properties, and distinguishing the component principles of bodies, without destroying their nature. *Elements of Chemistry*, v. 1 p. 3.

To pursue this subject to its full length, would be to detail many of the experiments, and most of the facts, in chemistry, which in this place would not only exceed our limits, but conduce to no good purpose, as its principles will be apparent in the several articles of this work which treat of the various processes, and the substances about which they are employed.

For the general method of analysing **ANIMAL MATTER** we refer to that article, of vegetables, to **VEGETABLE MATTER**, of minerals in general, to **MINERAL ANALYSIS**, of mineral waters, to **WATERS MINERAL**.

**ANALYSIS OF SOILS** See **SOIL** and **HUSBANDRY**.

**ANALYSIS**, in mathematics, is the method of resolving problems, and may be distinguished into the ancient and the modern.

The *ancient analysis* is the method of proceeding from the thing sought as taken for granted, through its consequences, to something that is really granted or known, in which sense it is the reverse of synthesis or composition, in which we lay that down first which was the last step of the analysis, and tracing the steps of the analysis back, making that antecedent here which was consequent there, till we arrive at the thing sought which was taken or assumed is granted in the first step of the analysis. This chiefly respected geometrical enquiries.

The principal authors on the ancient analysis, as recounted by Pappus, in the 7th book of his *Mathematical Collections*, are Euclid in his *Data*, *Porismata*, &c. de *Locis ad Superficiem*, Apollonius de *Sectionibus Rationis*, de

*Sectione Spatii*, de *Tactionibus*, de *Inclinationibus*, de *Locis Planis*, &c. de *Sectionibus Conicis*, Aristæus, de *Locis solidis*, and Eratosthenes, de *Mediis Proportionalibus* from which Pappus gives many examples in the same book. To these authors we may add Pappus himself. The same sort of analysis has also been well cultivated by many of the moderns, as Fermat, Viviani, Guldalius, Snellius, Huygens, Simpson, Stewart, Lawson, &c. and more especially Hugo d'Omerique, in his *Analysis Geometrica*, in which he has endeavoured to restore the Analysis of the ancients. And on this head, Dr Pemberton tells us "that sir Isaac Newton used to censure himself for not following the ancients more closely than he did, and spoke with regret of his mistake, at the beginning of his mathematical studies, in applying himself to the works of Descartes, and other algebraical writers, before he had considered the Elements of Euclid with that attention so excellent a writer deserves that he highly approved the laudable attempt of Hugo d'Omerique to restore the ancient analysis."

In the application of the ancient analysis to geometrical problems, every thing cannot be brought within strict rules, nor any invariable directions given, by which we may succeed in all cases, but some previous preparation is necessary, a kind of mental contrivance and construction, to form a connexion between the data and quæsitæ, which must be left to every one's fancy to find out, being various, according to the various nature of the problems proposed. Right lines must be drawn in particular directions, or of particular magnitudes, bisecting perhaps a given angle, or perpendicular to a given line, or perhaps tangents must be drawn to a given curve, from a given point; or circles described from a given centre, with a given radius, or touching given lines, or other given circles, or such-like other operations. Whoever is conversant with the works of Archimedes, Apollonius, or Pappus, well knows that they founded their analysis upon some such previous operations, and the great skill of the analyst consists in discovering the most proper affections on which to found his analysis. For the same problem may often be effected in many different ways, and that which leads to the conclusion by the most obvious and satisfactory steps, is the one which ought to be adopted.

*Modern Analysis*, consists chiefly of algebra, arithmetic of infinites, infinite series, increments, fluxions, &c., of each of which a particular account may be seen under their respective articles.

These form a kind of arithmetical and symbolical analysis, depending partly on modes of arithmetical computation, partly on rules peculiar to the symbols made use of, and partly on rules drawn from the nature and species of the quantities they represent, or from the modes of their existence or generation.

The modern analysis is a general instrument by which the finest inventions and the greatest improvements have been made in mathematics.

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and philosophy, for near two centuries past. It furnishes the most perfect examples of the manner in which the art of reasoning should be employed; it gives to the mind a wonderful skill for discovering things unknown, by means of a small number that are given, and by employing short and easy symbols for expressing ideas, it presents to the understanding things which otherwise would seem to lie above its sphere. By this means geometrical demonstrations may be greatly abridged; a long train of arguments, in which the mind cannot, without the greatest effort of attention, discover the connection of ideas, is converted into visible symbols, and the various operations which they require, are simply effected by the combination of those symbols. And, what is still more extraordinary, by this artifice a great number of truths are often expressed in one line only instead of which, by following the ordinary way of explanation and demonstration, the same truths would occupy whole pages or volumes. And thus, by the bare contemplation of our line of calculation, we may understand in a short time whole sciences, which otherwise could hardly be comprehended in several years.

From a comparison of the peculiar natures of the ancient and modern analysis, it results, that the ancient method may, in some respects, be regarded as more perspicuous than that of the moderns, though the latter be far superior to it in point of dispatch and facility of invention. That the former is the most proper for one who is entering upon mathematical pursuits, as it will accustom him to a pure, clear, and accurate mode of investigation, and demonstration; but that the modern analysis should be recommended to his attention, is soon in proper habits of reasoning established, because he may thereby be enabled to extend his views, and to strike out new improvements and discoveries.

Or, adopting the conclusion of Mr Woodhouse's judicious reflections on this subject, we may say, that, "If mental discipline and recreation are sought for, they may be found in both methods; neither is essentially inaccurate; and, although in simple enquiries the geometrical has greater evidence, in abstruse and intricate investigations the analytical is most luminous; but, if the expeditious deduction of truth is the object, then the analytical calculus ought to be preferred. To arrive at a certain end, we should surely use the simplest means, and there is little to praise or emulate in the labours of those who resolutely seek truth through the most difficult paths, who love what is arduous because it is arduous, and, in subjects naturally difficult, toil with instruments the most incommodious." Phil Trans 1802, part I.

*Residual Analysis*, a branch of the algebraic art, invented by the late Mr John Landen, and applied to the solution of those problems which have of late been more generally solved by the doctrine of fluxions. This method was called the residual analysis, because, in all cases

where it is made use of, the conclusions are obtained by means of residual quantities. In this analysis a geometrical or physical problem is reduced to another purely algebraical, and the solution is then obtained, without any supposition of motion, and without considering quantities as composed of infinitely small particles.

The residual analysis proceeds by taking the difference of the same function of a variable quantity in two different states of that quantity, and expressing the relation of this difference to the difference between the two states of the said variable quantity itself. This relation being first expressed generally, is then considered in the case when the difference of the two states of the variable quantity is = 0.

Mr Landen published the 1st book of his *Residual Analysis* in 1764, and therein exemplified its usefulness, in several algebraic enquiries, and in determining the tangents, evolution, ordinates, points of contrary flexure, double and triple, &c points, asymptotes, centers, &c of curve lines. In the 2d book it was intended to shew the application of this analysis in a variety of mechanical and physico-geometrical enquiries; but that book was never published.

*Analysis of powers*, is the same as resolving them into their roots, and is otherwise called evolution.

*Analysis of curve lines*, shews their constitution, nature and properties.

*Analysis and Synthesis*, as opposed the one to the other, have been so ably developed by Pappus, in the 7th book of his *Mathematical Collections* above mentioned, that we are persuaded a translation of the passage will be interesting to our scientific readers.

The analysis, says that celebrated geometer, is the way by which we proceed from the thing demanded, granted for the moment, till we have connected it by a series of consequences with something anteriorly known, or placed it among the number of principles known to be true. This method, therefore, enables us to rise from a truth or a proposition to its antecedent, and we call it analysis or resolution, because it is a solution in an inverted sense. In the synthesis, on the contrary, we proceed from the proposition which is found last in the analysis, disposing regularly according to their nature, the antecedents which were above presented as consequents, and combining them respectively until we arrive at the proposed object where we had commenced the operation in the former case.

We distinguish two kinds of analysis in the one which may be named contemplative, it is proposed to ascertain the truth or the falsity of a proposition advanced; the other is referred to the solution of problems, or to the investigation of unknown truths. In the first, we assume as true or as previously existing the subject of the proposition advanced, and proceed by the consequences of the hypothesis to something known, and if the result be thus found true, the proposition



advanced is likewise true. The direct demonstration is afterwards formed, by taking up again in an inverted order the several parts of the analysis. If the consequence at which we arrive in the last place is found false, we thence conclude that the proposition analysed is also false. When a problem is under consideration, we first suppose it resolved, and then pursue the consequences thence derived until we come to something known. If the ultimate result thus obtained be comprised in what the geometer calls data, the question proposed may be resolved, the demonstration (or rather the construction) is also constituted by taking the parts of the analysis in an inverted order. The impossibility of the last result of the analysis will prove evidently in this case as well as in the former, that of the thing required.

There is, besides, in the solution of every problem, that which is called the determination, that is to say, the part of the reasoning by which it is shown when, how, and in how many ways, the problem may be resolved.

We trust that, after duly considering the preceding extract, but little will be necessary to render the characters of mathematical synthesis and analysis sufficiently evident. In the former method, the proposition enunciated is always the ultimate consequence of the series of reasonings which constitute the demonstration; it is, in fact, a composition, for we join principle to principle, until we arrive at that consequence. In the analysis, on the contrary, by supposing the question resolved, we embrace the subject proposed in its aggregate, and it is by causing it to pass through different forms, or by giving, so to speak, various translations of the same enunciation, that we arrive at the solution required.

Similar methods of investigating truth may be adopted in other sciences. Condillac, in the fourth volume of his *Cours d'études*, shows that the whole art of reasoning consists merely in discovering the identity of several propositions—it is the order according to which the propositions are connected which constitutes the method. Thus, when we reason synthetically, all the propositions of which we make use are identical up to the last, which is itself a consequence of the preceding and which if it comprises the subject of the enunciation, shews that the proposition advanced is true. When we reason analytically, we proceed from the enunciation which is not identical of itself, and all the transformations by which we pass are only hypothetical, but when we have reached the last, it must always be possible to render it identical, whence results the determination of the quantity sought and then, by the mutual connection of the ideas previously expressed, all the intermediate propositions will become identical, and consequently the question proposed is resolved.

Those to whom the operations of algebra are familiar will readily perceive, that in thus tracing the process of analytical reasoning, we have only been sketching the progress of that

calculus in the resolution of equations, they will see that, since by the last operation we obtain the value of the unknown quantity, the final equation would become identical if we there substituted this value and that it would be the same with regard to all the preceding steps.

ANALYSIS, in logic, signifies the method of tracing things backward to their source, and of resolving knowledge into its original principles. This is also called the method of resolution, and stands opposed to the synthetical method, or that of composition.

ANALYSIS, in rhetoric, is that which examines the connections, tropes, figures, and the like, enquiring into the proposition, division, passions, arguments, and other apparatus of rhetoric.

ANALYSIS is also used for a kind of syllabus, or table of the principal heads or articles of a continued discourse, disposed in their natural order and dependency.

ANALYSIS is likewise used for a brief, but methodical, illustration of the principles of a science, in which sense it is nearly synonymous with what we otherwise call a synopsis.

ANALYST, a person who analyses something, or makes use of the analytical method.

In mathematics, a person skilled in algebra, or in the mathematical analysis in general.

ANALYTICAL *a* (from *analysis*) 1 That resolves any thing into first principles (*Boyle*) 2 That proceeds by analysis (*Glanville*)

ANALYTICALLY *ad* (from *analytical*) In such a manner as separates compounds into simples.

ANALYTICK *a* (*ανάλυτικος*) The manner of resolving compounds into the simple constituent or component parts (*Watts*)

ANALYTICS, the science, or doctrine and use of analysis.

To ANALYZE *v a* (*ανάλυα*) To resolve a compound into its first principles (*Boyle*)

ANALYZER *s* (from *to analyze*) That which has the power of analyzing (*Boyle*)

ANAMABOA or JAMISSIA, a town of Africa, on the Gold Coast, where the English have a fort, the country about it is fertile, and produces plenty of corn, but the principal trade is in gold and slaves.

ANAMBA, an island in the Indian Sea, west of the island of Borneo. Lon 106 44 E. Greenwich Lat 2 58 N.

ANAMOOKA, or ROTTERDAM one of the new islands, called the Friendly Islands, in the South Pacific Ocean. Lon 174 35 W. Greenwich Lat 20 15 S.

ANAMORPHOSIS, in perspective and painting, a monstrous projection, or a representation of some image, either on a plane or curve surface, deformed or distorted, but which in a certain point of view shall appear regular, and drawn in just proportion.

Anamorphosis, or monstrous images, may also be made to appear in their natural shape and just proportions by means of mirrors of

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certain shapes, from which those images are reflected again, and then they are said to be reformed

For farther particulars, see Wollius's *Catoptrics* and *Dioptrics*, and some other optical authors See also Hutton's *Math* and *Phil Dictionary*

**ANANAS**, (*ananas*) The egg-shaped pineapple The plant which affords this fruit, is the *bromelia ananas folis ciliato-spinosis mucronatis spica comosa* of Linnæus It is used principally as a delicacy for the table, and is also given with advantage as a refrigerant in fevers See *BROMELIA*

**ANANAS WILD** See *BROMELIA*

**ANAPÆSI**, in ancient poetry, a foot consisting of two short syllables and one long such is the word *scôpûlôs* It is just the reverse of the dactyl

**ANAPÆSTIC VERSES**, those consisting wholly or chiefly of anapests

**ANAPHALANTIASIS**, (*anaphalantiasis*, *αναφαλάντιαισις*, from *αναφαλάντω*, bald) In medicine, a thinness of the hair upon the eyebrows

**ANAPHORA**, in rhetoric, the repetition of the same word or words in the beginning of a sentence or verse Thus Virgil,

Pan etiam Arcadia mecum se iudice certet,  
Pan etiam Arcadia dicat se iudice victum

Many fine specimens of the use of this figure may be found in the Scriptures, and particularly the Psalms Thus, in Ps clixvi "The Lord looseth the prisoners the Lord openeth the eyes of the blind the Lord raiseth them that are bowed down the Lord preserveth the strangers the Lord loveth the righteous the Lord shall reign for ever And again in Ps. xlii. is a very grand example of the anaphora The voice of the Lord is powerful the voice of the Lord is full of majesty the voice of the Lord breaketh the cedars yea, the Lord breaketh the cedars of Lebanon the voice of the Lord divideth the flames of fire the voice of the Lord shaketh the wilderness the Lord shaketh the wilderness of Kadesh

**ANAPHORA**, in astrology, the second house, or that part of heaven which is 30° from the horoscope.

**ANAPHRODISIA**, (*anaphrodisia*, *αναφροδισια*, from *α*, priv and *φροδισια*, the fast of Venus) Impotence A genus of diseases in the class locales, and order dysorexiæ of Cullen It either arises from paralysis, *anaphrodisia paralytica*, or from gonorrhœa, *anaphrodisia gonorrhœica*

**ANAPLASIS**, (from *ανα*, and *πλασσω*, I form,) among ancient physicians, the replacing of a fractured bone in the same situation it obtained before it was broken

**ANAPLEROSIS**, among surgeons, expresses the restoring deficiencies, and in this sense is the same with prosthesis.

**ANAPLEROTICS**, (from *αναπληρωω*, I fill up,) in pharmacy, such medicines as promote the growth of flesh in wounds and ulcers

**ANAQUITO**, in geography, a country of America, in Peru, and in the province of Quito,

## A N A

**ANARCH** : An author of confusion (*Milton*)

**ANARCHI**, *Anarchoi*, in antiquity, a name given by the Athenians to four supernumerary days in their year, during which they had no magistrates, the time being employed in creating new ones.

**ANARCHIAL** *a.* (from *anarchy*) Confused, without rule or government (*Chryse*).

**ANARCHY** *s.* (*ἀναρχία*.) Want of government, a state without magistracy (*Swift*) The Jewish history presents numerous instances of anarchy in that state, usually denoted by this phrase, th it in those days there was no king in Israel, but every man did that which was right in his own eyes, which is a just picture of an anarchy The first anarchy we read of in that commonwealth is that which ensued on the death of Joshua, who leaving no successor, the government devolved to the elders of the tribes, who ruled each according to his own will After the death of these elders, the anarchy became complete

**ANARGYRUS**, in ancient writers, denotes a person without money, though otherwise sufficiently accommodated with land, and other effects

**ANARHICAS** Wolf-fish a genus of the class and order pisces, apodalia Head round, blunt, fore-teeth in each jaw, conic, large, divergent, six or more, grinders in the lower jaw and palate, rounded, gill membrane, seven-rayed, body, roundish, caudal fin, distinct Three species, all inhabitants of the northern seas (See Nat Hist pl VII) A lupus Ravenous wolf-fish fifteen feet long, a most fierce and ravenous fish, that will fasten on anything within its reach feeds on smaller shell fishes, which it grinds to pieces with its teeth, and swallows shells and every other part the grinders are often found fossil, and are called load-stones flesh good, but not often eaten A minor Less wolf-fish Inhabits the Greenland seas, with large eyes near the top of the head, resembling those of a dog, large mouth, three sharp, strong, unequal teeth on each side of each jaw, with two smaller in the interior space between A pantherinus Panther-wolf-fish Body covered with round brown spots, inhabits the northern and frozen seas; above three feet long, is mucous, inflated, yellowish, and sprinkled over with dots in the place of scales

**ANARRHINUM** In botany, a genus of the class and order didynamia, angiosperma Calyx five-leaved, corol with a nectariferous prominence at its base, pointing downwards the upper-lip flat, without palate, and the orifice pervious capsule two-celled, many-valved It has five species, chiefly found in the southern parts of Europe. A fruticosum, a native of mount Atlas, is a beautiful ever-green shrub, with white flowers, without spurs.

**ANARTI**, or **ANARTES**, in ancient geography, a people who inhabited the north-west part of Decea

**ANAS**. In zoology, a genus of the class and

order aves, anseres Bill convex, obtuse, the edges divided into lamellate teeth, tongue fringed, obtuse, three fore-toes connected, the hind one solitary A hundred and eighteen species (See Nat Hist pl. VIII) Of these some have bills gibbous, and others equal at the base Of the former are, 1 A cygnus Wild-swan, bill semi-cylindric, black, cere yellow, body white Inhabits Europe, Asia, and America 2 A olor Tame-swan same bill, cere and body inhabits Europe and Asia, and is tamed almost every where, is mute, robust, long-lived; feeds on grass and fishes, builds in high grass near lakes, and lays every other day, eggs from six to eight, carries its young on its back when much alarmed, its flesh, when young, was formerly much esteemed 3 A ingricollis Black-necked swan Inhabits Falkland islands, size that of a cygnus 4 A atrata Black-swan Black, wings edged with white, bill red Botany Bay 5 A hybrida Hybrid swan Inhabits Chili Size that of a goose 6 A cygnoides Chinese goose Inhabits Europe, Asia, and Africa bill semi-cylindric, cere gibbous, eyelids tumid above three feet long Three varieties 7 A gambensis Spur-winged goose Africa Size that of a common goose 8 A indica Barred headed goose India Flesh good 9 A coscoroba Chili goose Chili large bill dilated and rounded at the point, body white 10 A melanotos Black-backed goose Coromandel length two feet nine inches 11 A grandis Greylt goose Siberia Size, a cygnus 12 A hyperborea Snow-goose Europe, and North America length thirty two inches, flies in vast flocks a very stupid bird 13 A picta Painted-goose Statenland length twenty-eight inches 14 A magellanica Magellan-goose Inhabits the straits of Magellan size twenty-four inches 15 A antarctica Antarctic goose size from twenty four to twenty-six inches Two varieties 16 A variegata Variegated-goose, above brown, spotted with white, beneath chestnut, spotted with white and black New Zealand size that of a major 17 A leucoptera Bustard-goose, Falkland islands size from thirty-two to forty inches flesh good 18 A cinerea Loggerhead-goose, Falkland islands size thirty-two inches, flesh rancid 19 A ridora Sheldrake Barrrough-duck herd greenish black, body variegated with white Europe and Asia, two feet long, feeds on fishes, insects and herbs, lays from fifteen to twenty roundish white eggs, in rabbit's holes, flesh rancid 20 A spectabilis Grey-headed duck 21 A fusca Velvet duck 22 A nigra Black diver, all of Europe and America size from twenty-two to twenty-four inches 23 A regia Royal duck Chili much larger than a boschas 24 A nilotica Nile duck 25 A beringi Bering duck Bering's island, size of a goose 26 A albifrons White-fronted goose. Europe, Asia, and America migrates southerly in winter, size two feet four inches The above are all that are known to have the bill gibbous at the base Those whose bill is equal at the base, are

too numerous to be individually recapitulated; the following are the chief 1 A marila Scaup-duck black, shoulders waved-cinereous, belly, and spot on the wings, white Europe, Northern Asia, and America in winter migrates into warmer countries, feeds on shell fishes, size from eighteen to twenty inches 2 A vegetum Bean-goose, Cinereous, beneath dirty-white, bill compressed at the base, tail coverts white, legs saffron Hudson's Bay, and the Hebrides, in autumn comes to England in flocks, and is destructive to corn, size from two and a half to three feet 3 A erythropus Barnacle Cinereous, front white Europe, sometimes America is plentiful on the sea-coasts of England in the winter length twenty-five inches 4 A bernicla Brent goose, brown, head neck, and breast black, collar white North America, Asia, and Europe, size that of the barnacle migrates southerly in autumn, and flies in wedge-shaped flocks, with perpetual cackling feeds on sea-plants, berries, and marine insects, flesh, when tamed, good 5 A mollissima Eider-duck Bill cylindric, cere on the hind part blind, wrinkled Northern parts of Europe, Asia, and America length twenty-two inches, feeds on tustaceous animals, lays five greenish eggs, in a nest strewn with its own down flesh and eggs good the plumage constitutes the much valued luxury, eider down 6 A clypeata Shoveler, of which there are many varieties in Europe, Asia, and America 7 A formosa Bukal teal The lake Baikal, length fifteen inches Two varieties 8 A clangula Golden-eye Varied with black and white, head tumid, violet, at each corner of the mouth a large white spot Europe, Asia, North America length nineteen inches, builds in the hollows of trees, and preys on shell fishes, mice, fishes, and frogs. 9 A ferina Pochard Red-headed wigeon Two varieties, Europe, Asia, and America length nineteen inches good flesh 10 A crecca Common teal Three varieties Europe and Asia, length fourteen inches 11 A boschas Mallard Wild duck tame-duck Six varieties a cinereous, middle tail feathers of the middle recurvate, bill straight collar white 6 varieties in its colours by domestication 7, back sooty, much larger 8 size of 7 body tinged with grey 9 bill hooked Europe, Asia, and America, about stagnant waters length twenty-three inches feeds on frogs, snails, and almost any filthy substance, builds sometimes near waters, sometimes in trees Lays from ten to sixteen bluish-white eggs

ANASARCA (anasarca from *ana*, through, and *sarx*, flesh, or in the flesh) A species of dropsy from a serous humour, spread between the skin and flesh, or rather a general accumulation of lymph in the cellular system. Dr Cullen ranks this genus of diseases in the class cachexia, and the order intumescencia He enumerates the following species, viz 1. Anasarca serosa, as when the due discharge of serum is suppressed, &c 2 Anasarca oppulata, as when the blood vessels are considerably pressed, which happens to many pregnant women,

**ÆC.** 3. *Anasarca exanthematica*, which occurs after ulcers, various eruptive disorders, and particularly after the erysipelas. 4. *Anasarca analmia*, when the blood is rendered extremely poor from considerable losses of it. 5. *Anasarca debiliūm*, when feebleness is induced by long illness, &c.

**ANASARCOSUS** *a.* (from *anasarōs*.) Relating to an *anasarca*.

**ANASPASIS** (from *ana*, and *spasmo*, to draw together.) General spasm, or convulsion-fits. It is often however restricted to spasmodic contractions of the stomach.

**ANASTALTICA** (*anastaltica*, *sc. medicinalia*, *anastaltica*, from *anastalla*, to contract.) Stipules. Astringents.

**ANASTATICA**, in botany, rose of Jericho a genus of the class and order tetradynamia siliculosa. Siliule retuse, crowned at the edge with valves twice as long as the partition, and a mucronate oblique style in the middle. The cells two-seeded. The only known species is a native of Palestine. It is often found in our gardens.

**ANASTATICA**, in helminthology, a species of vorticella, in the fifth order of vermes, or infusoria. It is compound, with bell-shaped flowers, foot-stalks acaly and rigid. This is the second species of clustering polypes described by Trembley.

**ANASIOMATICS**, or **ANASTOMOTICS**, (from *anastomōs*, I can stop,) in pharmacy, medicines supposed to have the power of opening the mouths of vessels, and promoting the circulation of the blood.

**ANASTOMOSIS** (*anastomosis*, *anastomōsis*, from *ana*, through, and *stoma*, a mouth.) The communication or inoculation of vessels with one another.

**ANASTOMOSIS**, in botany, a species of the *Phallus*, which see.

**ANASTROPHE**, in rhetoric and grammar, denotes the inversion of the natural order of the words, such as *saxa per et scopulos*, for *per saxa et scopulos*.

**ANASTROUS SIGNS**, in astronomy, the twelve portions of the ecliptic, anciently occupied by the respective signs, but which they have now deserted by the precession of the equinoxes.

**ANATHEMA**, among ecclesiastical writers, denotes whatever is set apart, separated, or devoted; but is most usually meant to express the putting off a person from the privileges of society and communion with the faithful. The anathema differs from excommunication in the circumstance of being attended with curses and execrations. There are two kinds of anathemas, the one judicial, and the other abjuratory. The former can only be denounced by a court of pope, or a synod; the latter makes a part of the ceremony of abjuration, the convert being obliged to anathematize the heresy he renounces.

In ancient censures we meet with an *anathema*, *anathema*, called *anathema*, and anathema, the latter concerning its import and use, as *Joseph* says it is an Hebrew word,

signifying the Lord is come, and he particularly applies it to the confusion of those who still abuse the privilege of the Gospel, notwithstanding that the Lord was come among them.

St. Jerome says it was more a Syriac than an Hebrew word, though it had something in it of both languages, signifying our Lord is come. But he applies it against the perverseness of the Jews and others who denied the coming of Christ, making this the sense of the apostle, if my man love not the Lord Jesus Christ, let him be anathema, the Lord is come.

According to this sense, *maranatha* could not be any part of the form of excommunication, but only a reason for pronouncing the anathema against those who expressed their hatred against Christ, by denying his coming, either in words, as the Jews did who blasphemed him, and called Jesus anathema or accursed, or else by wicked works, as those who lived profanely under the name of Christians. Others of the ancients interpret the word of the future coming of Christ, particularly St. Austin, who says *maranatha* is a Syriac word signifying the Lord will come. And he particularly applies it against the Arians, who could not be said, as he much iritably thought, to love the Lord, because they denied his divine nature. Dr. Hammond and others will have anathema *maranatha* to have answered to the third and highest degree of excommunication among the Jews, called *shammatha*.

**ANATHEMA**, in heathen antiquity, an offering or present made to some deity, on account of good fortune, &c. and hung up in the temple.

**ANATHEMATICAL** *a.* (from *anathema*.) That has the properties of an anathema. **ANATHEMATICALITY** *ad* (from *anathematia*.) In an anathematical manner.

To **ANATHEMATIZE** *v. a.* (from *anathema*.) To pronounce accursed by ecclesiastical authority, to excommunicate (*Hammond*).

**ANATHOLOSIS** (from *ana* and *thōs*, to disturb.) In medicine, a confusion in the symptoms or appearance of disorders.

**ANATHOLIA**, a city of Palestine, north-east of Jerusalem, and not far from it. It was one of the cities of Refuge, and was the birth-place of the prophet Jeremiah.

**ANATHIRON**. See **ANATRON**. **ANATIC PROPORTION** (from *ana*, or *ANA*, which see.) An equality of measure or proportion in the ingredients of a composition.

**ANATICULA**, (*little duck*.) a term used by Roman authors, to denote affection.

**ANATIPFROUS** *a.* (from *anus* and *fero*, Lat.) Producing ducks (*Brown*).

**ANATOCISM** (*anatocismus*, Lat. or *ana*, application, and *tocis*, weary.) The accumulation of interest upon interest. This is the worst kind of usury.

**ANATOMICAL** *a.* (from *anatomy*.) 1. Relating, or belonging to anatomy. 2. Proceeding upon principles taught in anatomy (*Swift*).

**ANATOMICALLY** *ad* (from *anatomia*.) In an anatomical manner (*Brown*).

**ANATOMIST**, (*anatomist*) He that studies the structure of animal bodies, by means of dissection (*Prior*)

To **ANATOMIZE**, *v a* (*anatomize*) 1. To dissect an animal (*Hooker*). 2. To lay any thing open distinctly, and by minute parts (*Shakespeare*)

**ANATOMY** (*anatomia*, *anatomia*, or *anatomia*, from *ana* and *tomos*, to dissect), the art or science which teaches the situation, figure, connexions, fabric, actions and uses of the several parts of an animal body

In this definition of the term, anatomy should apply to animals in general but having been appropriated to the frame of man exclusively, it has been necessary to invent another term, to express the organs and their respective uses of other animals, as they appear upon actual dissection, and the term *Zootomy*, or *Comparative Anatomy*, has been fixed upon for this purpose See *COMPARATIVE ANATOMY*

We shall here give a general outline of the science, and consistently with the plan we mean uniformly to pursue, shall enter into a more distinct description of the particular parts or organs referred to, under their separate denominations

#### Origin of Anatomy

Anatomy, like all other human arts, has its fabulous epochs. Passing these by, however, and forbearing all enquiry into the lives or practice of Esculapius, and his sons Machaon and Podalirius, both of whom are said by Homer to have accompanied the Grecian army in its attack upon Troy, we shall commence our sketch with Hippocrates, of whom we have received an account very different from that of fable, and who is said to have been a descendant of the Podalirius we have just named

Hippocrates flourished about four centuries before the Christian era, and from his writings is to be collected all the actual information of his day upon the subject of anatomy. This great physician, says Dr Hooper, in his well-selected historical compendium, whose principal attention was directed to the symptoms and cure of diseases, was, nevertheless, well aware of the importance of anatomical knowledge to perfection in the healing art: hence we find, that his works abound with anatomical facts and observations, interspersed with the prevailing doctrines of the day. When it is considered, how many obstacles were thrown in the way of this science, from climate, prejudice, and superstition, the perseverance and acquirements of this great man, the ornament of the medical profession, cannot be sufficiently admired. He describes some parts peculiar to the human body which could only be ascertained by actual dissection. The body he made to consist of solids, fluids, and spirits of containing and contained parts. The elementary humours he divided into four kinds: blood, phlegm, choler or bile, and melancholy or occult bile. This was agreeable to the philosophy of the age, in which he lived, as likewise the notions of all bodies being composed of earth, air, fire, and water. He never distinguished between nerves, arteries, veins, or tendons, but calls the heart and its pericardium a powerful muscle, he knew the aorta, vena cava, pulmonary arteries and veins, and entertained obscure notions of the uses of the valves; but considered the auricles as a fan. He mentions the distribution of the arteries and veins by trunks and ramifications from the heart; and asserts, that

all the arteries originate from the heart. The liver was thought to be the root of the veins, the fountain of the blood, and he supposed it to separate bile. He thought the arteries carried the spirits, but was entirely ignorant of the circulation of the blood, and of the use of the diaphragm, and his seating the soul in the left ventricle of the heart is a memorable example of human vanity, and of that inherent inclination in man, boldly to account for what is inexplicable. The heart and lungs, he imagined, received part of our drink. Of the organ of hearing, it is concluded, he knew little, for he only mentions the tympanum. As to the brain, which he thought a gland (an idea which has since been erroneously supposed to belong to Malpighi), the nerves and their uses, vision and the senses, he was totally ignorant in regard to the causes of their several actions, yet he makes the brain the seat of wisdom. The glands he imperfectly understood. His Pythagorean doctrines of conception, generation, and pregnancy, are, in general, absurd and superstitious; as likewise his notions of the Pythagorean numbers, which seem to have been the prevailing philosophical follies of the day. On moles, false conceptions, and the nourishment of the fetus, a rational judgment is formed, he comprehended the communication from the mother to the fetus by means of the umbilical cord; though, in another place, he supposes that it absorbs nutriment by the mouth, and from the surrounding fluid in the ovum.

After Hippocrates, anatomy continued to be improved, but, as opportunities were extremely limited from the prejudices of mankind, its progress was but slow, and chiefly confined to the two schools of Athens and Alexandria. In the former, the names of Socrates, Plato, Xenophanes, Aristotle, and Theophrastus, are still preserved along with many of their works; and, although we perceive that their general attention was directed to philosophy, yet natural history and anatomy were far from being overlooked. Their opportunities, however, of examining bodies were confined, and after their time, the study of natural knowledge at Athens sunk for ever. But while it decayed in Greece and Asia, it rose with increased energy, under the protection of the Ptolemies, at Alexandria. In this school, which was so long pre eminent, Erasistratus and Herophilus were highly distinguished for anatomical knowledge. By the liberal patronage of the Ptolemies, they enjoyed ample opportunities of dissecting human bodies, and the consequent improvements which anatomy received were very great. They not only corrected many former errors, but wrote with great judgment upon neurology. They observed a variety of structure in nerves supplying different parts, and hence distinguished them into those which were necessary to sense, and those which were subervient to motion.

Between the times of Herophilus and Erasistratus to Galen, a period of five hundred years, celebrated, Rufus Ephesus, and the sensible and elegant writer Celsus, flourished. The two latter have given the appellations and situations of all the parts of the human body, in which many discoveries appear to have been made from the time of Hippocrates. Neither the one nor the other dwell much on the uses of the parts. Rufus writes Greek in the concise Attic style, and Celsus is the most classical writer that ever appeared in the art of medicine.

Claudius Galenus, or Galen, was physician to

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long emperors, and was, without exception, the most distinguished practitioner of the age in which he lived. He arranged all the prior anatomical science, that Herophilus and Erasistratus had obtained from the actual dissection of human subjects, and incorporated it into his voluminous treatises on all the branches of medicine. The medical principles of this great man, formed on the Peripatetic philosophy of Aristotle, are not to the present purpose, except that they reigned triumphantly in the schools and universities, disdaining and crushing all innovators or improvers, for a period of nearly fifteen hundred years. The celebrated Galen, however, was a man of uncommon erudition, and he brought into one point of view with much labour, learning, and industry, all the medical and philosophical science of his predecessors. The anatomical part was indubitably extracted from the great Herophilus and Erasistratus and, consequently, in general contains what those first dissectors of human bodies had observed or written. In the works of this eminent physician, anatomy appears very conspicuous and methodical. He gives the situation and uses of all the parts of the human body, whether animal, vital, or natural. What discoveries he made, cannot be ascertained, but Galen was the first author who seems to have digested, in regular order, the human functions, the brain and its membranes, the senses, the contents of the thorax and abdomen, osteology, a complete myology, and neurology, in which are the origin and insertion of the muscles, their action, &c., and the distribution of the whole nervous system. The lacteal vessels, likewise, were well known, though the extent of their effects, their passing through the thoracic duct and subclavian vein, or the blood, were not comprehended. The exhalant arteries and inhalants were mentioned, both by Hippocrates and Galen, but their principles of action were unknown. The circulation of the blood, the real uses of the liver, glands, heart, diaphragm, pancreas, kidney, ureters, bladder, univers, cellular structure, the power of the nervous system over the arteries and veins, the lymphatic absorbent system he was not acquainted with.

From the time of Galen to the fifteenth century, anatomy was rather on the decline, anatomists being considered learned or ignorant in proportion to their knowledge of his works. The destruction of Alexandria introduced learning among the Arabians, but they made little progress in the knowledge of the human body. Abdolla-his, however, towards the close of the twelfth century, exposed many of Galen's errors in osteology, by frequenting burial grounds.

Among the early cultivators of the science of anatomy in the sixteenth century, the great Vesalius flourished, who may with propriety be styled the reformer of anatomy, being the first who dared expose the errors of Galen, in medicine and anatomy, by referring to the human body. This wonderful man, whose perseverance and genius cannot be sufficiently admired, was born at Brussels, in 1514. After having gone through the usual studies of the age, he went to Montpellier, to study medicine. The principal professors in the university of Paris requested him to come there, where he attended their lectures. Vesalius's zeal for medicine, particularly anatomy, induced him to leave every danger, which he was exposed, he clandestinely procured a body for a dissection. He did not, however, confine his attention to the human subject only, but opened a great number

of animals. In the pursuit of his favourite science, his veneration for Galen diminished in proportion, as he detected his inaccuracies; till at length he threw off all control of this great standard of ancient medicine and anatomy, and became the advocate for actual dissection of the human body, to which he constantly referred in all his disputations.

The war which commenced at that time in France, obliging Vesalius to leave Paris, he returned to his own country, Louvain. The knowledge he had acquired in anatomy induced him to profess it publicly in that city, but, in order to extend his anatomical researches, in 1535 he followed the army of the emperor Charles the Fifth, against France. His reputation increased. He was chosen professor of anatomy in the university of Leuven, by the republic of Venice, and there gave lectures on medicine, particularly anatomy, for seven years.

In 1539, Vesalius published his anatomical plates which attracted the admiration of the learned. In this, and in his other works, all the errors of Galen are exposed. A multitude of enemies sprung up against this bold innovator of old established authority. All Europe resounded with invectives against him. Fustachius at Rome, Dr. Anderson at Marburg, and Sylvius at Paris, became his public enemies, particularly the latter who employed every species of calumny to lessen him in the esteem of his patrons. Instead of Vesalius, he called him Vesanus or a madman, and accused him of ignorance, arrogance, and impiety. Fallopius was the only one among his opponents who praised his moderation. Having been a pupil of Vesalius, he never forgot how much he was indebted to his preceptor, and, although he was far more able than Sylvius to criticize, from having powerful objections to bring forward against the work, he proceeded in the most delicate and respectful manner, influenced by the greatest esteem and gratitude for the assistance he had received from his venerable master. Vesalius, on the other hand, acted towards his pupil in the most gentle and honourable manner. As soon as the remarks of Fallopius on his work had reached Spain, Vesalius prepared to answer them and replied to him as a father would to his son. Fallopius, who has rendered his name dear to posterity by his extensive knowledge in anatomy, possessed sentiments very different from Sylvius, he was not ashamed of acknowledging his obligations to Vesalius, for the greater part of his information on anatomy he admits that Vesalius has not shewn sufficient respect to Galen, but confesses that his objections are generally correct. Notwithstanding all opposition, the reputation of Vesalius daily increased, and he established anatomy on solid and permanent principles when the emperor Charles the Fifth, by whom he had been already honoured, nominated him his first physician, and kept him constantly at court. He now gained the confidence of the nobility and frequently gave unequivocal marks of his profound knowledge in the practice of physic. But an unexpected event soon reduced this great man to distress. Upon the death of a Spanish gentleman, whom he had attended during life, Vesalius requested permission of the relatives of the deceased to open the body, he being very desirous of investigating the obscure cause of his death, which request was granted. Some of the spectators, who probably were not Vesalius's friends, declared they saw the heart palpitate upon his opening the thorax: their



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accusations soon reached the ears of the nobleman's relations and raised a suspicion that the body was opened alive, in consequence of which Vesalius was prosecuted for homicide and impiety, and brought before the Inquisition, which severe tribunal was about to punish him for the crime, when Philip the Second of Spain, suggested the means of removing him from the decision of his judges, and caused him to make a pilgrimage to the holy Land, in consequence of which Vesalius resolved to make the tour of Palestine. He passed over to Cyprus with James Mylatoste, a Venetian general, and thence to Jerusalem. Soon after the death of the celebrated Fallopius, which happened in the year 1564, the senate of Venice recalled Vesalius to fill the chair, but on his voyage to Padua, he was shipwrecked on the island of Zante, where this great man reduced to the utmost extremity perished with hunger on the 15th of October 1564 at the age of fifty years. It is said, that a goldsmith, who landed on that part of the island soon after the accident, caused him to be interred, and an epitaph to be engraven on his tomb in the church of the Virgin Mary in that land.

Vesalius had scarcely attained his twenty-fifth year when he published his work, *De Situ et Actione Corporis Humani*—on the Structure of the Human Body. This extraordinary production would appear incredible in so young a man, were it not attested by the best authority. "Vesalius, in my opinion," says Mons. Portal, "is one of the greatest men that ever existed. Let us remember the boast of Copernicus, natural philosophers of Galileo, Torricelli, &c., mathematicians of Puschal and the geographers, of Christopher Columbus, I shall always rank Vesalius above them all. The house of Vesalius was lately the convent of Capuchins, at Brussels. These men could do it as an honour to cite their letters. *Lex Eddibus Vesalians*."

From the time of Vesalius the value of human dissection was fully appreciated, though opposed by the prejudices of the vulgar.

The beginning of the seventeenth century is remarkable for the discovery of the most important function of animated bodies by our countryman Harvey. This great physician was born of a respectable family at Folkestone, in Kent on the 2d of April, 1578. At ten years of age he was sent to a grammar-school at Canterbury, and at fourteen removed to Caius college, Cambridge. At nineteen he travelled through France and Germany to Padua, in Italy, where, having studied physics under Fiasachinus Radius, John Minadous, and Fabricius ab Aquapendente by whom he was taught anatomy, he was created doctor of physic and surgery in that university, in 1602. Returning soon after to England, he was incorporated M.D. at Cambridge, went to London for practice and married. In 1604 he was admitted candidate of the college of physicians in London, and three years afterwards fellow. In 1615 he was appointed lecturer of anatomy and surgery in that college.

In the year 1632 he was made physician to Charles the First, as he had been before to king James, and adhering to the royal cause upon the breaking out of the civil wars, attended his majesty at the battle of Edgehill, and then at Oxford, where, in 1642, he was incorporated M.D. In 1645 the king got him elected warden of Merton college in that university, but upon the surrendering of Oxford the year after to the parliament, he

left that office, and retired to London. In the year 1651 he published his work on the generation of animals a book replete with interesting observations, and which would have been more so but for some misfortunes, by which his papers perished during the time of the civil wars. On Michaelmas-day 1654, he was chosen president of the college of physicians in his absence, and coming there the day after, acknowledged his great obligations to the electors for advancing him to such honour and dignity, as if he had been chosen to be "Medicorum omnium apud Anglos princeps" but his age and weakness were so great, that he could not discharge the duty incumbent upon that great and distinguished office, he therefore requested them to elect Dr. Prujean, who had deserved so well of the college. As Dr. Harvey had no children, he made the college his heirs, and settled his paternal estate upon them in the July following. He had three years before built them a combination room a library, and a museum, and in 1656 he brought the deeds of his estate, and presented them to the college. He was then present at the first festival instituted by him to be continued annually, together with a commemorative speech in Latin, to be spoken on the eighteenth of October, in honour of the benefactors to the college, having appointed a handsome stipend to the orator, and also to the keeper of the library and museum, which are still called by his name. He died June 3, 1657; and was carried to be buried at Hemstead, in Hertfordshire, where a monument is erected to his memory.

In the year 1616 Dr. Harvey read a course of lectures, in which he first opened his discovery relating to the circulation of the blood, which some judicious anatomists had before only suspected to exist in a vague and confused manner, and which others had only known to take place in some particular part. From this period Harvey demonstrated and taught in his public lectures, and by simple and clear experiments proved to the most incredulous minds, that the blood not only traversed the structure of the lungs, but that it circulated in every part of the body by means of an admirable arrangement on which depends the life of man. He fully evinced the alternate contraction and dilatation of the heart; the passage of the blood from the two venæ cavæ into the right auricle from thence into the right ventricle and through the lungs, its reception into the left auricle from the pulmonary veins, its expulsion from thence into the left ventricle, from which it was propelled through all the arteries of the body, and returned by the veins. So clearly were the phenomena of the whole circulation understood, and so admirably explained, by Dr. Harvey, that notwithstanding he wrote near two hundred years ago, this function has never since been laid down with more truth, simplicity, and elegance.

It does not appear that Harvey was assisted in his discovery so much by the inspection of the human body as that of animals, as frogs, snakes, and the like, and the circumstances which result from the application of ligatures to the limbs of living bodies, the opening of arteries and veins, and the labour of those who preceded him. "New proofs of the passage of the blood from arteries into veins, and not from veins into arteries," says this great man, "may be taken from the valves of veins. If we inject air," says he, "into these canals, it will not pass from the heart towards the extremities, whilst it is conveyed without any impediment through the veins of the extremities to



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wards the heart. The valves, by their position and structure, form so many obstacles to the passage of blood from the heart into the veins, and, on the contrary, facilitate its course in the vessels." To prove that these valves in a living man oppose to the blood passing towards the extremities a resistance equal to that which they had made to the air injected into the dead subject, Harvey recommends us to observe what takes place in the veins of a man's arm of a spare habit. "If a ligature be made above the condyles of the humerus, the vessels are irregularly swelled when its pressure on the arm is inconsiderable, their diameter seems to be larger in some points than in others; when narrower, he was of opinion, was occasioned by the valves." "If," continues he, "we carry the finger from the ligature downwards towards the hands a resistance to the flowing of the blood is perceived, which cannot be surmounted, but, on the contrary, the blood is pushed forwards by a light pressure when directed from below upwards." The structure of the heart itself likewise afforded additional proofs of the new doctrine. Of what utility were the valves be that are situated about its orifices? Why should some open from without inwards, and others from within outwards? Because, says Harvey, the former facilitate the entrance of the blood into the heart, and prevent its exit; and the latter permit the passage of the blood out of the heart, and prevent its return. "In this way the immortal Harvey elucidates all his propositions by decisive proofs, drawing interesting conclusions from each of them."

It is objected to Harvey, however, and we are afraid upon good grounds, that he was too avaricious of distinction on account of his discovery, and that he passed over in silence the names of various contemporary and antecedent physiologists, whose observations and experiments were in perfect coincidence with his own, and led directly towards that full disclosure the merit of which is certainly due to himself. Servetus, Columbus, Vesalius, and Casalpinus, were unquestionably worthy of being quoted, yet he has taken no notice of their labours; how withstanding that each of them had been the four principal objects of the circulation. Servetus the victim of Calvin, had described the passage of the blood from the right ventricle of the heart into the lungs, had considered the septum of this ventricle as impermeable to the blood; and had traced the entrance of inspired air into the arteries of the lungs, its transit thence into the pulmonary veins, and its passage to the placenta. Columbus with the blood that flowed from the placenta, Columbus had clearly ascertained the nature of circulation, Vesalius had described the structure and use of the valves of the heart, and Casalpinus, better informed than either of them, had made use of their discoveries in proof of the existence of a corporeal circulation, and the permanency of solids in veins a fact which was further established by the experiments of Vesalius and others.

After the discovery of the circulation of blood, in 1628, discovered the lacteal system, in 1661, traced to the thoracic duct the venous subclavian vein (1665), and Haller (1694) discovered the liver as not merely a digestive organ but also a blood reservoir, hence to equal parts. The medical, however, derived from his having entertained ideas of the physiology of the

lymphatic system, which was afterwards more fully explained by Gisson.

\* The two last centuries have nearly perfected our knowledge of the human body. Every nation in Europe has produced anatomists of the greatest reputation: the names of Albucasis, Cooper, Diemerbroeck, Higginson, Cheselden, Lewenhoeck, Malpighi, Mead, Rayn, Willis, and Winslow, form but a small number of those who have enlightened the science of anatomy in the seveneenth century. In the eighteenth, the following are particularly distinguished: Haller, Morgagni, Tissot, Walter, Scarpa, Soemmerring, the Monroes, the Hunters, and Cruikshank.

Fortunately for mankind, anatomy is now become an indispensable branch of medical science; and throughout Europe we have every where distinguished teachers, who are daily adding to the stock of useful information.

Yet the science is extremely deficient in its nomenclature, and is in truth extraordinary, that while every enclosing element has been given to a reformation of the technical language of botany and chemistry, while the first has, in consequence, obtained no small degree of perfection, and the second has been very considerably ameliorated and simplified, while mineralogy is every day dropping a part of its jargon, and assuming a more definite and classical vocabulary, every attempt towards reforming and purifying the technology of every branch of the medical art, instead of being encouraged, has been rather repelled and resisted, and with respect to the department of anatomy, we are at this moment in the use of the same crude nomenclature in regard to its more important principles, which was put forth in its earliest infancy. Every viscus, and almost every vessel, has been accurately traced, and the use of almost every organ accurately determined, or plausibly conjectured, but the language of the science is barbarous, inadequate, and indecive, founded upon no common system, and multifariously generated from an heterogeneous association of Hebrew, Greek, Latin, Arabic, and modern European terms, sometimes jangle, and sometimes illegitimately intermarried by a mixture in the same word of two distinct tongues or dialects.

### Scope of Anatomy.

The human body is composed of solids and fluids. physiology, as a general science, contemplates both anatomy, as a branch only of physiology, is confined to the former, the latter, antecedently to dissection, being too considerably dissipated, or transformed in their nature, to render them objects of palpable contemplation.

The solids of the human body are either hard or soft, and may be briefly divided into

- 1 Osteology, or the doc rine of the bones
2. Myology, of the muscles.
3. Angiology, of the vessels.
- 4 Neurology, of the nerves or sensitive system.

5 Splanchnology of the embryo, or general mass of the remaining soft parts of the body with their respective appendages and in-  
volucres

To these divisions many writers add, as distinct branches, Osteology, Chondrology, Synsarcology, Bursiology, Adenology, and Angiology. Of these we may observe in few words, that the first and last are not, properly speaking, subjects of anatomical attention. Osteology, or the doctrine

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of the formation and growth of bones, and Hy-  
drology, or the doctrine of the fluids, can have  
little or no reference to the art of dissection the  
former cannot be developed by the knife, and the  
latter must evade its power. Chondrology and  
Syndesmology, the doctrine of cartilages and liga-  
ments, are naturally branches of Myology, or  
Osteology; these two substances being more im-  
portant to bone or muscle, partaking of a  
middle nature and serving the purpose of unit-  
ing the one to the other, or of rendering bone  
moveable upon bone, they are for the most part  
bony membrane without a calcareous deposit.  
Bursology and Adenology, the doctrine of mucous  
pouches and glands, are, in like manner, distinct  
parts of Splanchnology or of that part of Angio-  
logy which constitutes the secretory system. They  
are either secreting organs, or reservoirs of a se-  
creted fluid, or sub-serve both purposes at the  
same time.

Our syllabus is, therefore, in its arrangement  
new and simplified, but we trust not improper-  
ly so, and with this short notice of an excision  
of what appears to us an unnecessary and super-  
fluous division we now proceed to the out-  
lines of which it consists.

## OSTEOLOGY, OR DOCTRINE OF THE BONES

Bones are hard, compact, inflexible, and insen-  
sible substances, composed of earth and gluten,  
which support and form the stature of the body,  
defend its viscera, and give adhesion to its muscles.

The substance of bones is of three kinds — com-  
pact, as in the bodies of the long bones, spongy, as  
in the extremities of the long bones, and reticu-  
lar, called also the cancelli of bones, as in the ca-  
vities of bones which have marrow.

The figure of bones is various, yet they are  
mostly divided, from their shape, into broad and  
flat, long and round, and cylindrical bones. Long  
and irregular shaped bones are divided into a body  
and extremities, and flat bones into body and  
margins.

Bones are variously named, some from their  
situation, as the frontal, parietal, occipital, nasal,  
malar, &c., others from their figure, as the eth-  
moid bone, clavicle, os cuboides, n. vicularis, ti-  
bia, &c.; and some from their use as the sphenoid  
bone, the maxillary bone, the scapula, &c.  
The processes and cavities of bone are named  
after their figure, as the acetabulum of the os in-  
fernum, the odontoid process of the second  
cervical vertebra, the coracoid process of the sca-  
pula, &c., or from their use, as the trochanters  
of the thigh-bone, or from their situation, as the na-  
sal, palatine, orbital processes.

If a process be large, and of a spherical shape,  
it is termed sometimes the caput or head, if the  
head be flattened, it takes the name of a condyle.  
Other processes are termed mastoid, or mammil-  
lary, from their resemblance to a nipple, styloid  
and coracoid, from their similitude to a stiletto or  
the beak of a crow, some spinous, which appear  
like thorns — others derive their names from their  
direction, as the longitudinal, perpendicular, hori-  
zontal, oblique, transverse processes.

There is a kind of eminence peculiar to bones,  
called an epiphysis, which should be distinguish-  
ed from an apophysis, the latter being nothing  
more than a process, while an epiphysis is a part  
of a bone connected to the same bone by an in-  
tervening cartilage, thus the condyles of the  
thigh-bone of a child are epiphyses, and are sepa-  
rable from the femur. These epiphyses become  
apophyses in the adult.

Bones support and give stature to the body, de-  
fend its viscera, and give adhesion to its mus-  
cles.

When the bones are deprived of their soft parts,  
and hung together in their natural situation by  
means of wire the whole is termed an artificial  
skeleton when they are kept together by means  
of fluid ligaments, they constitute a natural ske-  
leton.

Table of the Bones.

		No.
The bones of the cranium, or skull	Os frontis	1
	Ossa parietalia	2
	Os occipitis	1
	Ossa temporalia	2
	Os ethmoides	1
	— sphenoides	1
	Ossa maxillaria	
	— superiora	2
	— jugalia	2
	— nasalia	2
The bones of the face	— lachrymalia	2
	— palatina	2
	— spongiosa	
	— inferiora	2
	Os vomer	1
Dentes, or teeth	— maxillare	
	— inferior	2
	Incisores	— 8
	Cuspidati	— 4
	Barbipedes	— 8
Bone of the tongue, or	Molares	— 8
	Sapientiae	— 4
Bones of the internal ear, situated within the tem- poral bone	Os hyoides	2
	Mallei	— 2
	Inci	— 2
	Ossa orbicularia	2
	Stapides	— 2
The spine	— Cervical	— 7
	— Dorsal	— 12
	— Lumbar	— 5
	Sacrum	— 1
	Os coccygis	— 1
The thorax	Sternum	— 1
	Costae	— 24
The pelvis	Ossa innominata	— 2
	Claviculae	— 2
The shoulder	Scapulae	— 2
	Ossa humeri	— 2
The arm	Ulnae	— 2
	Radia	— 2
The fore arm	Ossa carpalia	— 8
	— Ischia	— 2
	— Carpiformia	— 2
	— Trapezia	— 2
	— Trapezoides	— 2
The hand	— Metacarpia	— 5
	— Phalanges	— 14
	— Metatarsia	— 5
	— Phalanges	— 14
	— Tarsia	— 2
The leg	— Tibia	— 2
	— Fibulae	— 2
	Ossa calcia	— 2
	— Astragali	— 2
	— Calcanei	— 2
The foot	— Metatarsia	— 5
	— Phalanges	— 14
	— Tarsia	— 2
	— Calcanei	— 2
	— Astragali	— 2

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Squamous bones of the thumb and great toe, occasionally found — 8

Total 228

The skeleton is divided into head, trunk, and extremities.

## The Head.

There is a great variety in the shape of the heads of individuals. The head of females is more delicate, the insertions of the various muscles of the face are not so strongly marked. The cranium of different nations also vary; in the generality of Europeans the shape is oblong; in the Turk and Algerine it is round; and in the Chinese and Tartar broad. The cranium of the African is flattened on the forehead, and the teeth and chin are extended forward. The shape of the head of the Asiatic and American negro also varies considerably from the European.

The head is divided into the cranium, or skull, and face.

The shape of the adult cranium is in general spherical, but there is great variety in skulls. The superior part is arched; in some this arch is greater than in others; anteriorly it is more or less flattened, posteriorly more or less rounded, but always considerably more convex than on the interior part; at the sides the cranium is flattened. There are a great number of processes and depressions on the under surface, so as to render it very peculiar in its appearance.

The adult cranium is composed of eight bones, viz. one os frontis, which forms the forehead, two ossa parietalia, situated at the upper part and sides of the head—two ossa temporum, placed below the parietal bones, one occipital, forming the back part of the head, one sphenoidal, placed in the middle of the basis of the cranium, and one ethmoid bone, situated behind the root of the nose. For a more particular description of which see these respective bones under their alphabetical arrangement; as parietal bones, temporal, ethmoid, sphenoid, &c.

Upon viewing the superior part of a skull externally, several zigzag lines are observable, called sutures; that which extends from one temple across over the head to the other temple is termed the coronal suture; it unites the frontal bone to the two parietal that which proceeds from behind one ear upwards across to the other, is the occipital or lambdoidal suture, it unites the occipital bone to the two parietal and the suture which extends upon the crown of the head from the lambdoidal to the coronal uniting the two parietal bones is called the sagittal. These are sometimes termed the true sutures, to distinguish them from two spurious or squamous, which are found, one on each side of the cranium, extending from the temple backwards, in the form of an arch, and uniting part of the temporal bone to the parietal. Besides these two sutures two other portions are to be noticed, the one belonging to the lambdoidal, the other to the squamous suture, being, in fact, continuations of them the one is called *adventum suture squamosa*, the other *adventum suture lambdoidal*. There are, sometimes one or more triangular-shaped bones observed in the course of some of the sutures, these are called *os venosum*, *triangularia*, or *Wormiana*. The chief use, which arises from this partition of the cranium into so many pieces, seems to be to facilitate the ossification after birth and so to serve, in some measure, to prevent the spreading of fractures from one bone to another.

Besides these sutures, there are several prominences upon the upper part of the cranium; two in the frontal bone, one immediately over each eye between it and the suture; one in the middle of each parietal bone; and one in the middle of the occipital these point out the centre of ossification of those bones.

Upon the internal surface of the upper part of the cranium there is a number of grooves, in an arborescent form; these are made by the spinous artery of the dura mater. The sutures are here seen in the form of a line, not dove-tailed, and the whole surface appears more polished than the external.

The bones forming the upper part of the skull, or, as it is sometimes called, the calvaria, are composed of an external and an internal table, which are of a compact structure, and of a spongy intervening substance, called the *medullum*, or *diploe*.

The internal surface of the base of the cranium is divided naturally into several considerable depressions, adapted to the lobes of the brain and cerebellum. The two anterior are immediately over the orbits, and are separated from each other by an obvious eminence, above the root of the nose, called *trigla*. Immediately before this eminence is a small hole, called the *foramen caecum*; and on each side of it are a number of perforations, which transmit the olfactory nerves into the nose, they are called the *foramina cribrosa*. Passing backwards, there are two round holes, near each other, one going to the bottom of each orbit, these are for the passage or the optic nerves, and are called *foramina optica*. Beyond these holes there is a small cavity, which will admit the end of one's little finger, surrounded by four processes, two of which are anterior, and two posterior, these are termed *clinoid processes*, and the cavity in their middle, which contains the pituitary gland, the *sella turcica*. Under each anterior clinoid process is a considerable fissure the *foramen lacerum orbitale superius*, which communicates with the orbit, and transmits the third, fourth, the first branch of the fifth; and the sixth pair of nerves, and the ophthalmic artery. Beyond this fissure proceeding backwards there is a round and then an oval hole, the first is the *foramen rotundum*, through which the second branch of the fifth pair of nerves passes, the other, the *foramen ovale*, is for the passage of the third branch of the fifth pair of nerves. Continuous to the *foramen ovale* is a small hole, the *foramen spinosum* through which the spinous artery of the dura mater enters. Between the *foramen ovale* and the posterior clinoid process on each side of the *sella turcica*, there is a considerable ragged aperture, the carotid canal, which is partly filled up with cartilage in the fresh subject, and is for the entrance of the carotid artery and the exit of the great intercostal nerve. A projecting portion of bone next presents itself, called the *pituitary portion of the temporal bone*; it has upon its posterior surface an oval opening, the *meatus auditorius internus*, through which the nerve for the organ of hearing, and the facial nerve, proceed. Immediately below this is an irregular oval opening, formed by the junction of the occipital with the temporal bone, this is the *foramen lacerum in basi crani*; through the anterior part of this opening passes the eighth pair of nerves, and the posterior part transmits the blood from the lateral sinus of the dura mater, whose course is marked by a deep groove leading to the *foramen lacerum* into the *jugular vein*. The portion of bone which proceeds backwards from the poste-

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rior clinoid processes, between the petrous portions of the temporal bone, is the cuneiform or basilar process of the occipital bone, it is somewhat hollowed for the reception of the medulla oblongata, which lies upon it. At the bottom of this process of bone is a considerable opening, called the foramen magnum occipitale; it transmits the spinal marrow, the vertebral arteries, and the accessory nerves of Willis, and a process of the second vertebra of the neck lies in its anterior part. Between this opening and the foramen lacerum in basi crani is the foramen condyloideum anterius, which gives passage to the ninth or lingual pair of nerves. Beyond the great occipital foramen is a crucial eminence, to which processes of the dura mater are attached, the horizontal eminence separates the two superior occipital cavities from the two inferior.

The bones of the skull of a fetus at birth are far more numerous than those of an adult, for many of the processes of the latter are epiphyses in the former; thus the occipital bone consists of four portions, the sphenoid of three, &c. There are no sutures in the cranium of the fetus. The parietal bones and the frontal bones do not coalesce until the third year, so that before that period there is an obvious interstice, commonly called mould, and scientifically, the fontanel, or fons pulsans. There is also a smaller space, occasionally, between the occipital and parietal bones, termed the posterior fontanel. These spaces between the bones are filled up by the dura mater and the external integuments, so that, during birth, the size of the head may be lessened, for at that time the bones of the head, upon the superior part, are not only pressed nearer to each other, but they frequently lap one over another, to diminish the size during the passage of the head through the pelvis.

*Oss. frontis, or Frontale*, situated in the anterior part of the skull, forming the forehead and upper part of the orbits, of a semicircular shape, and when detached from the other bones of the cranium has some resemblance to a cockle shell. Externally, where it forms the forehead, it is very smooth and convex, but below, where it assists in forming the orbit, it affords several processes and cavities. The inner and concave surface of this bone is turned towards the brain, and in the centre of its inferior part is the ethmoid bone, which is placed at the top of the cavity of the nostrils. It sometimes consists of two portions, in consequence of the sagittal suture being continued down through its middle to the nose. This is more frequent in females than males. Its processes are, two frontal eminences, which mark the centres of ossification, two frontal tuberosities, which are situated over the frontal sinuses; two superciliary ridges or arches which give origin to the frontal muscles, and whose extremities are called the angular or orbital processes, behind each external angular process the surface of the bone is considerably depressed, for the situation of a part of the temporal muscle, an external frontal spine, upon which the ossa nasi rest, an internal frontal spine, to which the dura mater adheres, and two orbital plates, which separate the orbits from the cavity of the cranium.

Its cavities are, the cerebral, which contains the anterior portions of the hemispheres of the brain, a large notch between the orbital plates for the situation of the cartilaginous plate of the ethmoid bone, two frontal or pituitary sinuses within the bone, above the root of the nose, they

are always separated by a thin bony partition, and open by two small holes into the nostrils, of which they form a part; two orbital cavities, in which are two depressions for the situation of the lachrymal gland, a notch in each superciliary ridge for the trochlear of the superior oblique muscle; a superciliary foramen, through which passes a small artery from within the cranium, together with a branch of the fifth pair of nerves to be distributed to the muscles and integuments of the forehead; the anterior orbital foramen, which affords a passage to a branch of the ophthalmic artery, and a small twig of the fifth pair of nerves into the nose, this foramen is sometimes formed by the junction of the ethmoid bone with the frontal, the posterior orbital foramen, which is smaller than the former, and deeper in the orbit; a depression behind the middle of the superciliary ridge for the situation of the lachrymal gland, the foramen cæcum, situated below the beginning of the internal frontal spine.

The frontal bone is connected with the two parietal by means of the coronal suture, with the two ossa nasi, the two superior maxillary bones, and the two lachrymal bones, by means of what is called the transverse suture, with the sphenoid bone by means of harmony, called harmonia sphenoidalis, with the ethmoid bone by harmonia ethmoidalis, and with the os jugale by means of suture.

The use of the frontal bone is to constitute the forehead, pituitary sinuses, part of the orbit, and to contain and defend the anterior lobes of the brain.

*Ossa Parietalia* called also *Ossa bregmatica* *Ossa sympleptica* *Ossa vertebra* *Ossa verticis*. Situated one on each side of the superior part of the cranium, and considerably convex and somewhat quadrangular. Each bone is distinguished into an external and an internal surface, and four angles, viz the frontal, sphenoidal, called also the spinous process, the occipital and mastoid. It has a semicircular ridge, from which the temporal muscle originates, and a foramen parietale, which is near the sagittal suture, and transmits an artery and a vein of the dura mater. Upon its internal surface are the grooves of the spinous artery, and when the two bones are united, there is a deep cavity extending along the sagittal suture, for the longitudinal sinus of the dura mater.

Each parietal bone is connected with its fellow by means of the sagittal suture, with the frontal bone by the coronal suture, with the occipital by the lambdoidal suture; and with the temporal by the squamous suture.

The use of these bones is, to form the superior part of the cranium.

*Oss. occipitis* called also *Oss. basilare* *Oss. memoria* *Oss. nervosum*.

Situated in the posterior part of the head, and is somewhat of a quadrate oblong shape. The external surface of the occipital bone is convex and very irregular, serving for the attachment of several muscles, the inferior portion of the bone is stretched forwards like a wedge, and at the base of this projecting portion are two condyles, which serve for the articulation of the head with the first vertebra of the neck. Its processes are upon the external surface. The occipital tubercle, in the middle of the bone to which the ligamentum nuchæ adheres, a transverse spine, proceeding from each side of the tubercle, to which the trapezius and complexus muscles are attached a lesser transverse spine, below the former, for the inser-





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the internal jugular, which begins on the internal and posterior surface of the petrous portion, and terminates in the seventh pair of nerves, it has immediately within it the internal opening of the aqueduct of Fallopius; a cavity between the zygomatic, auditory, and vaginal processes, which serves for the articulation of the lower jaw, and is separated in the middle by a fissure, into which the ligament that secures the articulation of the lower jaw with this bone is fixed, a considerable groove behind the mastoid process, from which the digastric muscle arises; the foramen stylo-mastoidium, so called from its situation between the styloid and mastoid processes, it is also called the aqueduct of Fallopius, and transmits the facial nerve; the fossa jugalis, a thumb-like cavity, situated below and on the fore part of the foramen stylo-mastoidium, the beginning of the internal jugular vein occupies this cavity, the carotid sinus, which begins before and a little above the jugal fossa; it first runs upwards, and then downwards, turning a kind of elbow, and terminates at the end of the petrous portion. Through this septum, namely the digastric and carotid arteries proceed to the brain, and the filaments of the intercostal nerve pass out to form the great intercostal nerve, the Eustachian tube, which runs outwards and backwards in an horizontal direction, until it terminates in the cavity of the ear, called the tympanum, the hiatus Fallopii, a small foramen situated within the skull, about the middle of the anterior surface of the petrous portion, it receives a twig of the portio dura, a branch in which a part of the lateral sinus is received.

Each temporal bone is united to the squamous suture, with the occipital bone by the lambdoid suture, with the sphenoid and other bones by harmony, and with the lower jaw by arthrodia.

The squamous portion consists of two tables and a diploe, the mammary process, of cells which communicate with the cavity of the organ of hearing, and the petrous portion is very hard and compact. The use of these bones is to contain the middle lobes of the brain, and the organ of hearing; and to concur in forming the temples and the basis of the cranium.

*Os ethmoidale* called also *Os ethmoidale* *Os cribrosum* *Os cribrosum*

A four-side bone, situated in the anterior part of the basis of the skull, behind the root of the nose, and between the orbits. Its processes are, a cerebral or cribiform plate, which lies horizontally above the root of the nose, within the cavity of the cranium. It is every where perforated by a number of small foramina, through which the olfactory nerves pass into the cavity of the nostrils. The crista galli, a process somewhat like a cock's comb, which proceeds upwards from the middle of the cribiform plate, and has attached to it the falciform process of the dura mater. Two orbital plates, called also ossa plana, and plaus papyracea, which are very smooth externally, and form the inner side of the orbits. The septum ethmoidale, nasal plate, azygous process, or perpendicular lamina, a considerable process descending directly under the crista galli into the cavity of the nose, and forming with the vomer the septum narium. Two cavernous substances, which are curled, like a piece of parchment, one on each side of the septum, called lacrimae, properly the superior turbated or spongy bones, and tonchea inferioris. Its cavities are, a number of cribiform foramina, situated on each side of

the crista galli. Two foramina orbitalia una, one situated in the line of union between the frontal bone and orbital plate of the ethmoid, for the passage of the nasal branch of the orbital nerve. A number of cells, which compose the internal part of the bone, and form the pituitary sinuses of the ethmoid bone.

The ethmoid bone is united to the os frontale, the two nasal bones, the two superior maxillary, the two palatine, the sphenoid bone, and the vomer, by harmony. It forms an extensive surface for the organ of smell, and constitutes part of the nose, orbits, and cranium.

The bones of the face are fourteen in number, and consist of those of the upper and under jaw. The upper jaw is formed of thirteen bones, viz two superior maxillary, two nasal, two palatine, two jugal or malar, two inferior spongy, two lachrymal, and the vomer, which are united to the cranium, and with one another, by harmony. The under jaw consists of one bone.

There is an obvious line, beginning at the external angle of the orbit, where the frontal bone is united to the cheek bone, which leads to the inferior opening in the orbit, proceeds upwards to the nose, whose root it crosses, and then traverses the other orbit to the external angle: this is called the transverse suture. The other harmonies of the face are named after the bones which they unite, as the zygomatic, nasal, palatine harmonies, &c.

*Ossa Maxillaria Superiora.*

Two hollow bones situated in the anterior and middle part of the face, and assist in forming the nose, orbit, and palate, so that their shape is very singular. Their processes are, the nasal, which forms the side of the nose. The orbital or plate, which forms part of the orbit. The malar, by which they are united to the cheek bone. The alveolar process, by which they are situated. The palate, which forms the palate. A spine, formed by the union of both palate portions, upon which the vomer rests. The orbital margin. Its cavities are, the lachrymal depression, called also antrum Highmorei, and the sinus maxillaris, in the body of the bone. The infra-orbital foramen, which opens into the nostrils. The infra-orbital canal, which passes under the margin of the orbit, and transmits the infra-orbital nerve. The lachrymal depression, situated in the superior and internal part of the nasal bone, for the situation of the lachrymal sinus, which is the canal nasalis, or ductus ad nasum, which conveys the tears into the nostrils. The palatine foramen, near the last tooth, which is the passage of the alveolar nerve. The anterior part of the palatine process, which has the corresponding notch of the os maxillare. The maxillary bone forms the foramen palatinum, or foramen minus, which transmits the inferior palatine nerve and artery.

Each superior maxillary bone is connected to its fellow, with the os frontale, the os sphenoidale, the lachrymal bone, the ethmoid bone, the os jugale, one palatine bone, and the os vomeris, by harmony, and with the os maxillare inferioris by symphysis.

The use of these bones is to form part of the face, palate, nose, nostrils, and orbit, and to afford a convenient situation for the organ of mastication.

*Ossa Maxillaria Inferiora* called also *Ossa jugalia*, *Ossa zigomatica*, or *Cheek bones*

Two bones situated in the lower part of the face, and nearly of a

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**quadrangular shape** The processes are, the upper orbitary, which forms part of the orbit and the sharp edge of the temple The inferior orbitary, opposite to the former, and constituting in part the bottom of the orbit and the edge of the cheek The internal orbitary, which also forms a part of the orbit The maxillary, by which it is united to the superior maxillary bone The zygomatic, which is joined to the temporal bone, to form the zygoma

The os jugale is united to the frontal, superior maxillary, sphenoid, and temporal bone, by suture. Its use is to assist in forming the face and orbits.

*Ossa nasi, Ossa nasalia, or Bones of the Nose,*  
Of an oblong and quadrangular shape, formed of a very compact substance, and placed close to each other in the superior and middle part of the nose, in such a way as to form a strong arch, called the bridge of the nose

In each bone may be noticed an external and an internal surface, and four margins There is always a small foramen in each bone for the passage of blood-vessels and nerves Their use is to form the bridge and external part of the nose

Each bone is connected with its fellow, and the superior maxillary bone by harmony, and with the frontal and ethmoid by the transverse suture

*Ossa Lachrymalia, or Ungues,*  
Two flat quadrangular bones, resembling somewhat the nail of the finger, situated one in each orbit at the internal angle, and separating the orbit from the nostrils The surface towards the eye is concave, and has a groove, in which the lachrymal sac is situated The internal surface is convex, and covers some of the ethmoid cells, and part of the nostril

Each bone is connected with the frontal bone, superior maxillary, and inferior sphenoid by harmony Their use is to assist in covering the labyrinth of the nose, in forming the orbit, and to afford a situation to the lachrymal sac

*Ossa sphenoid inferiora, Turbinate inferiora, or the inferior turbinates*  
Situated in the side and lower part of the nostrils, and are of a spiral and convoluted figure They augment the surface of the nasal cavity

Each bone is united with the superior maxillary, the palatine, lachrymal, and ethmoid bone, by harmony

*Ossa palati,*  
Extremely irregular in their shape situated in the middle part of the nose, from which they ascend to the orbits The irregularity of their surface gives rise to their division into palatine, sphenoid, nasal, and orbital portions They are covered by the palatine plate, which forms the posterior part of the roof of the mouth The posterior process, which is situated behind the last process The nasal process, which arises perpendicularly from the palatine, and covers a part of the surface of the hard palate The orbital process, which is situated in the orbit They form the posterior part of the palate

Each bone is united to its fellow the superior maxillary bone, the sphenoid, ethmoid, inferior sphenoid, and nasal, by harmony

The vomer is situated perpendicularly between the roof of the mouth and the ethmoidale, in the cavity of the nostrils, which divides into two parts It bears some resemblance to the dough-ware used in former times It is situated in the cavity of the nostrils

Superiorly it is united with the sphenoid bone by gomphosis, and with the ethmoid by harmony inferiorly with the superior maxillary and palatine bones by harmony, anteriorly it is united to the cartilaginous septum of the nose

## Os maxillare inferius

Mandibula, or lower jaw bone, shaped somewhat like a horse-shoe, and occupies the inferior and anterior part of the face Its processes are, two condyloid or articulatory, received into the articulatory cavities of the temporal bones Two coronoid, which are sharp-pointed, and give adhesion to the temporal muscles The alveolar, in which the teeth are fixed The symphysis of the jaw, in the middle of the chin The inferior margin, whose ends form the angles of the jaw Its cavities are, a semilunar notch, between each coronoid and condyloid process The alveolus, or cavity in which the teeth are fixed Two posterior maxillary foramina, one above each angle, on the inner surface of the jaw, which transmit the lower maxillary nerve and artery into a canal in the middle of the bone, called *canalis mentalis*, which conducts the same artery and nerve to the anterior maxillary foramina, upon the external surface of the bone, one on each side of the chin, from whence the artery and nerve again emerge upon the chin It retains the roots of the teeth in the alveolar margin, constitutes the inferior segment of the cavity of the mouth, and affords a point of adhesion to the muscles of the face, neck, throat, and tongue

The lower jaw is united to the temporal bones by gomphosis, with the teeth by gomphosis, and with the os hyoides and other parts by syssarcosis The symphysis joint of this bone with the os maxillare, is formed by the large articular cavity of the latter receiving the condyloid process of the lower jaw In this joint there is a moveable interarticular cartilage, which is very closely connected to the condyloid process and the articular cavity by ligaments arising from their edges, and the whole is surrounded by a capsular ligament fixed to the temporal bone and the neck of the condyle By the peculiar formation of this joint, the lower jaw has many motions; thus when the condyles slide forwards, the lower jaw passes horizontally forwards as in the action of biting, or the condyles only may be brought forwards while the rest of the jaw passes backwards, as in the case when the mouth is open The condyles may also slide alternately backwards and forwards, and *vice versa*, so that while one condyle advances the other moves backwards, turning the body of the jaw from side to side, as in grinding the teeth The principal use of the interarticular cartilages seems to be that of securing the articulation by adapting themselves to the different inequalities in these several motions of the jaws, and to prevent any injuries from friction

## The Cavities formed by the Bones of the Face and Cranium

Are, the orbits, nostrils, mouth, in which are the teeth, the fauces, in the anterior part of which is the os hyoides, and the cavity of hearing, situated in the temporal bone

The orbits are two conoidal cavities, situated under the forehead, and on each side of the roof of the nose The angles of the orbits are called canthi

The nostrils are two pyramidal cavities situated under the anterior part of the cranium, in the middle of the face, and covered anteriorly by the nose



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The use of these cavities is to form a situation for the organ of smelling, and the pituitary membrane of the nostrils, and to serve also for speech and respiration.

The cavity of the mouth is situated between the upper and under jaw, and is covered laterally and anteriorly in the fresh subject by the cheeks and lips; posteriorly it is continued into the fauces. The two superior maxillary bones and the palatine portions of the palate bones form the superior part of the mouth, and anteriorly it is closed by the teeth.

The teeth are hard bones, partly covered with a peculiar substance, called enamel, and fixed one after another in the upper and under jaw, in such a manner, that in the adult there are sixteen belonging to each.

Every tooth is divided into a crown, which is covered by the enamel, a neck, or the part embraced by the gum; and a root, also called the fang, which is hidden within the socket.

There are four kinds of teeth: incisors, cuspidati, bicuspidati, and molares.

The incisors are eight in number, four in each jaw, they are situated in the front of the mouth and are flat and sharp edged, so, as to cut the food, the roots or fangs are simple; those of the upper jaw are fixed obliquely backwards, so that they generally cover a small part of the incisors of the under jaw.

The tooth on each side of the incisors is called cuspidatus, or canine, they consequently are four in number. The fang of these teeth is single, and goes a considerable way in the jaw, especially the two of the upper jaw, which were supposed to go to the eye, and are therefore called the eye-teeth. The oral part of the cuspidati is rounded, and then end pointed, as their name implies.

The bicuspidati are eight, two being situated next to each cuspidatus, they appear at both extremities, as if they were formed by the junction of two incisors.

The molares are twelve, and situated three at the extremity of each jaw. The fangs of these are varied, those of the under jaw have two, and those of the upper three. Their oral extremities are full of irregularities, so that they are able to grind the food between them. The two last molares are distinguished by the name of dentes sapientie, they are always the last that appear, and not unfrequently the first which decay their fangs are squeezed, as it were, into one.

The teeth are fixed in the alveoli of the jaws by gomphosis, so that each tooth fills up its appropriate socket, which is separated from the next by an intermediate, thin spongy partition.

The cavity of the fauces is situated under the base of the cranium, within the superior bodies of the vertebræ and posterior part of the nostrils. It is composed of ten bones viz the occipital, two palatine, the vomer, the bodies of the three first vertebræ, the os hyoides, and the two temporal bones. See OCCIPITAL, &c.

The cavity of hearing is situated within the petrous portion of the temporal bones, and consists of the meatus auditorius externus, the cavity of the tympanum and the labyrinth.

In the fetus the squamous and petrous portion are divided by a cartilaginous substance. In consequence of the bony fibres being much more delicate than in the adult bone, very beautiful preparations of the bony organ of hearing can be made by cutting away the surrounding parts.

The soft parts which are placed in this cavity,

and which form the immediate organ of hearing, belong to the division of Splanchnology.

## The Trunk

Of the skeleton is divided into the spine, chest, loins, and pelvis.

The Spine has various denominations. *Columna spinalis. Columna vertebralis. Theca vertebralis. Spina dorsalis.*

It is a long, bony, and cartilaginous hollow column, extending from the occipital bone of the head down to the os sacrum, in the posterior part of the trunk. In the neck it projects somewhat forward to support the head, which would otherwise require a greater number of muscles. Through the whole length of the thorax it is carried in a curved direction backwards, and thus adds considerably to the cavity of the chest. In the loins the spine again projects forwards in a direction with the centre of gravity.

The spine is formed of twenty four bones, called vertebræ, which are very intimately connected together.

The vertebræ, from their situation with respect to the neck, back, and loins, are divided into cervical, dorsal, and lumbar; and each of these classes have particular characters.

Each vertebra is divided into surfaces, margins, a body, processes, and cavities.

The cervical vertebræ are seven in number, their bodies are smaller, and of a firmer texture than the other vertebræ. The transverse processes are short and bifurcated, and there is a foramen in their base peculiar to them for the passage of the vertebral artery and vein. The spinous processes are also forked, are shorter than those of the other vertebræ, and are much more inclined downwards. The oblique processes are more deserving of that name than either those of the dorsal or lumbar vertebræ.

The two first of the cervical vertebræ differ from the rest, the first is called atlas, it has no body, nor spinous processes, but forms an arch, which anteriorly surrounds the densiform process of the second vertebra. Instead of upper oblique processes, there are two articular sinuses. The second vertebra is termed epistropheus, densatus, or densatus. An adapted or densiform process at the upper part of the body is peculiar to it.

The dorsal vertebræ are twelve in number. They are distinguished by a depression at the sides of their bodies, and a superficial one in the points of the transverse processes, for the attachment of the great and little heads of the ribs.

The bodies of these vertebræ are more flattened at their sides more convex behind, and more concave behind than the other bones of the spine. Their upper and lower surfaces are horizontal. The spinous processes are long, flattened at their sides, divided at their upper and back part into surfaces by a middle ridge, which is received by a small groove in the inner part of the spinous process immediately above it, and connected to it by ligament, they are terminated by a kind of round tubercle. The transverse processes are of considerable length and thickness, and are turned obliquely backwards.

The lumbar vertebræ are five, they are much larger than the dorsal, and the transverse processes have no depression.

The vertebræ in birth, consist of three parts, connected together by cartilage; one of these is the body, and the other two the transverse processes. The anterior part of the first vertebra is entirely cartilage. The second vertebra often

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consists of five and six portions. The spinous processes are all cartilagin.

*The Thorax, or Chest.*

forms the upper part of the trunk. It resembles an arched bony cavity, narrow above, broad below, flat anteriorly, hollow posteriorly, and convex laterally. The bones which compose the thorax are the twelve dorsal vertebrae already described, the sternum, and twenty-four ribs.

The ribs are semi-circular bones, situated twelve on each side of the chest, and extending obliquely from the dorsal vertebrae round towards the sternum, to which they are connected by strong cartilages. They are distinguished into seven true ribs on each side, or those whose cartilaginous extremities are affixed to the sternum, and five spurious or false on each side, whose extremities do not reach the breast-bone. Each rib may be divided into a body, or middle part, two extremities, two margins, and two surfaces.

The cartilage which unites the anterior extremity of a rib to the sternum is long, broad, and strong, and in each of the true ribs reaches to the sternum, where its articulation is secured by a capsular ligament. The cartilages of the sixth and seventh ribs being much longer than the rest, are extended upwards to reach the sternum, they are usually united to one. The cartilage of the false ribs are supported in a different manner, they terminate in an acute point before they reach the sternum, the eighth rib being attached by its cartilage to the lower edge of the cartilage of the seventh, or last, of the true ribs, the ninth in the same manner to the eighth, and the tenth to the ninth, the cartilage of each rib being shorter than that of the rib above it. The two last are not fixed at their anterior extremities, but hang loosely, supported by ligamentous fibres.

The sternum, or pectoris, or breast bone, is an oblong flat bone, shaped somewhat like a dagger, situated in the anterior part of the thorax, between the true ribs. It is of a very spongy texture, and mostly consists of two, and sometimes of three portions. A sharply pointed cartilage is attached to the inferior extremity of the sternum, which is named, from its supposed resemblance, the xiphoid or ensiform cartilage. It is situated at the pit of the stomach.

The bones of the loins are the five lumbar vertebrae, which have already been described.

The pelvis, so named from its resemblance to a basin formerly used by barbers, tonsors, as it were, and hence of the trunk of the skeleton. It consists of four bones, two ossa innominata, the os sacrum, and the coccygis, which are situated at the bottom of the trunk, and above the lower extremities. It is composed of three parts, formed by three bones, the two ossa innominata, and the os sacrum, the rectum, and occasionally a part of the small intestines. The pelvis also serves as a firm support to the upper part of the body, and unites the bones of the trunk with those of the lower limbs.

There is a considerable difference of capacity in the male and female pelvis. The os sacrum is shorter and broader in the latter; the iliac portions of the ossa innominata are more expanded, whence it happens that the centre of gravity does not fall so directly on the upper part of the thigh as in man, from these circumstances the basin of the pelvis in women is broader, of an oval shape, being considerably wider from side to side, than from the symphysis pubis to the coccy-

gium; while in man it is rounder, and every where of less diameter. The inferior opening of the female pelvis is also proportionally larger in the female subject, the ischia being more separated from each other, and the foramen magnum ischi larger, so that where the ischiatic and pubic portions of the ossa innominata are united, they form a greater circle. The os sacrum is also more hollowed though shorter, and the os coccygis more loosely connected, and therefore capable of a greater degree of motion than in men.

*The Ossa Innominata called also Ossa Ilii, Ossa ischi, Ossa pubis, Ossa coxarum, Ossa coxendunt, Ossa anonyms.*

Constitute the side and anterior part of the pelvis, and are extremely irregular in their shape.

A bone is divided into three portions, viz ilium, the uppermost, ischium, the lowest, and pubis, the anterior. These are very commonly termed os ilium, os ischium, and os pubis.

Each os innominatum is connected with its fellow anteriorly by symphysis, with the sacrum posteriorly by strong cartilages and ligaments, and with the head of the thigh-bone by anasthrosis.

The os sacrum, which derives its name either from its being offered in sacrifice by the ancients, or from its supporting the organs of generation, which they considered as sacred, called also os lumborum, is a bone of a triangular shape, bent upwards, and situated at the bottom of the spine, and the posterior part of the pelvis. It is by many described as a bone of the spine, and from the irregularities resembling spinous and transverse processes, and its form, it seems to have some just claim to be considered as such.

*Os Coccygis.*

So called from its resemblance to a cuckoo's bill, consists very frequently of two, three, or four portions, which are triangular or irregularly shaped, they are placed at the extremity of the sacrum.

*The superior Forearm.*

Have from the superior part of the sides of the thorax, and are composed of the bone of the shoulder arm, fore arm, and hand.

The shoulder consists of two bones, the clavicle and scapula, which are united together immediately over the top of the os brachii, and form what is properly termed the shoulder, summitas humeri.

*Clavicula Clavi Iovula Furcata Os jugal*

Or collar bone is a long round bone, shaped like the letter J, and situated obliquely in the upper and lateral part of the chest.

The scapula or blade bone, is of a triangular shape, and is situated in the upper and lateral part of the back. Its anterior and internal surface is irregularly concave from the impression of muscular and tendinous packets, its posterior and external surface is convex and divided into two unequal parts by a considerable process or spine.

The shoulder joint is one of considerable importance, it is loose, moveable, and very free in its motions. It is formed by the large round head of the humerus, and the shallow articular cavity of the scapula, the sides of which are elevated with cartilage. A capsular ligament, large, wide, and loose, fixed to the neck of the scapula and humerus, surrounds this joint. A considerable quantity of synovia is requisite to lubricate it, and accordingly it is supplied by several bursae mucosae opening into it, independently of the natural secretion of the capsule: of these we observe one,

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under the tendon of the subscapularis, one under the short head of the biceps, one between the coracoid process and the scapula, and a very large one under the acromion process. The motion of the shoulder joint is restrained, and the joint rendered more secure, by the acromion process, which projects over it by the coracoid process below by a strong ligament, which extends from the coracoid to the acromion process by a ligament extending from the acromion to the capsule of the joint and principally by the action of the four muscles which are inserted into the capsular ligament.

The *brachium* or arm consists of one long bone, the *os brachii*, or *os humeri*, which occupies the space between the junction of the cervical with the scapula and the fore arm. It is long cylindrical bone, thickest at its ends, and distinguished into body and extremities.

The *humerus* is connected with three bones, with the scapula by arthrodia, and the cubit and radius by *ginglymus*.

The fore arm is composed of two bones, the *ulna* and *radius*; the first forms the internal and posterior part, and the second the external and anterior part. The *ulna* is connected superiorly with the trochlea of the humerus, and inferiorly with the carpus, both by arthrodia, and with the radius by trochoides.

The *radius* is connected to the humerus by *ginglymus*, to the cubit by an inextensible ligament and trochoides, and to the carpus by arthrodia.

The bones of the hand consist of those of the carpus, metacarpus, and fingers.

The *carpus*, or wrist, is situated between the fore arm and metacarpus. It is composed of eight bones, which lie close to one another in a double row, one of which is superior, the other inferior. In the superior row are (from the thumb to the little finger) *os scaphoides* or navicular, *os lunate*, *os cuneiforme*, and *os orbiculare*, or *subrotundum*. In the lower row are, *os trapezium*, *os trapezoides*, *os magnum* and *os unciforme*.

All of these bones bear some resemblance to the names given to them, they are extremely difficult, nevertheless, to be known when separated.

The bones of the carpus are united to those of the fore-arm and metacarpus by arthrodia. A capsular ligament surrounds them, and the joint is strengthened by several others, which proceed in all directions.

The metacarpus is placed between the carpus and fingers. It consists of five long rounded bones, one of the thumb, and four metacarpal bones of the fingers.

The fingers *digitus manus*, are situated at the inferior extremity of the metacarpus, and consist of a thumb and four fingers. The thumb has two bones, and each finger three, which are called phalanges, from their being placed in rows. Each bone is broadest at its upper extremity, and formed into a superficial cavity whose edges are rough for the insertion of ligament the body, or middle part, is convex externally, and concave before the lower extremity is rounded, and like a trochlea, or a pulley.

## The inferior Extremities

Consist of the bones of the thigh, leg, and foot.

The thigh has but one bone which is by far the largest in the body, the *os femoris* or femur.

It is so called, because it bears the body, and is a long cylindrical bone, thickest at its extremities, and situated between the pelvis and leg.

The head, which is received into the acetabulum of the *os innominatum* has a small dimple at its middle, for the attachment of the round or restraining ligament. The neck, upon which the head stands, is rough, and gives attachment to the capsular ligament. The great trochanter, is a large unequal eminence below the neck, for the insertion of the glutæi muscles. The little trochanter receives the *psoas* and *iliacus internus*. The body of this bone is smooth and convex before, and hollow behind, where there is a rough line called *linea aspera*.

The femur is connected to the acetabulum of the *os innominatum* by enarthrosis, and to the tibia and patella by *ginglymus*.

The leg is the part of the lower extremity between the femur and foot. It consists of three bones, the tibia, fibula and patella.

The tibia is a long, thick, triangular, and cylindrical bone, much the thickest at its upper extremity, placed between the femur and tarsus in the anterior and inside of the leg.

The anterior ridge or angle of the tibia is called the *promontory*, and the external gives attachment to the interosseous ligament. At the lower end of the tibia there is a considerable process which forms the inner ankle.

The tibia is connected to the femur and patella by *ginglymus*, to the fibula by *syneurosis*, and to the scapula by arthrodia.

The fibula is a longitudinal bone situated in the outer part of the leg, by the side of the tibia. At its lower extremity it has a considerable process which forms the outer ankle.

It is connected to the tibia by an interosseous ligament, and to the astragalus by arthrodia.

The patella, or kneecap, is a small triangular, or heart shaped spongy bone, situated between the inferior extremity of the thigh-bone, and the upper part of the tibia.

It is connected to the condyles of the femur by *ginglymus*, and with the tibia by *syneurosis*.

The bones of the foot, like those of the hand are distinguished into three orders, those of the tarsus, metatarsus, and toes.

The tarsus, like the carpus, consists of a number of small bones. They are seven in number, and are placed between the leg and metatarsus. They are denominated *astragalus* or *calcis* or *navicular*, or *scaphoides* or *cuboides*, and three *ossa cuneiformia*. Viewed all together, the superior part of the tarsus appears convex and headed, its hinder part forming the heel, its anterior part the back of the foot. Below it is concave, and affords a secure passage for the blood-vessels and nerves.

The connexion of the bones of the tarsus is with the tibia and fibula by arthrodia, and with the metatarsal bones, and also with one another, by *amphiarthrosis*.

The metatarsus is situated between the tarsus and toes, and is composed of five longitudinal bones which form the back and sole of the foot. These agree in their general character with those of the metacarpus, but are longer and thicker; the basis or posterior extremity of each is thicker than the other extremity, which is rounded. Their bodies are somewhat triangular.

The great toe is composed of two, and the other toes of three small bones, called phalanges.

There are a number of bones called sesamoid, sometimes found among the bones of the toes, of the size of a small pea, situated generally about the joint of the thumb and great toe.

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The natural colour of recent bones is various, in the fetus they are red, bluish in youth, and white in old age.

Bones have always their arteries arising from contiguous trunks and their veins return the blood in o those in the neighbourhood. In the larger and cylindrical bones there is a canal for these vessels. The nerves pass in along with the arteries, from contiguous branches. The absorbents come out with the veins.

Bones are connected with one another, so as to admit of motion, which kind of union is termed diarthrosis, or so as to admit of no motion, which is termed synarthrosis, and when connected with one another by an intervening substance, the union is termed symphysis. Diarthrosis, synarthrosis, and symphysis, are to be considered as the genera only of articulations, each genus comprehending several species, which are arranged as follows.

Genera

Species.

Diarthrosis

**Enarthrosis**, when the round head of one bone is received into the deep cavity of another, so as to admit of motion in every direction as the head of the os femoris with the acetabulum of the os innominatum.

**Arthrodia**, when the round head of a bone is received into a superficial cavity of another, so as to admit of motion in every direction, as the head of the humerus with the glenoid cavity of the scapula.

**Ginglymus**, when the motion is only flexion and extension thus the tibia is articulated with the os femoris, and the cubit and radius with the os humeri.

**Trochoides**, when one bone rotates upon another, as the first cervical vertebra upon the odontoid process of the second, and the radius upon the ulna, or cubit.

**Amphiarthrosis**, when there is motion, but that very obscure, as the motion of the metacarpal and metatarsal bones.

**Suture**, when the union is by means of dentiform margins; as in the bones of the cranium, hence the sagittal, lambdoidal or occipital, and coronal sutures.

**Harmony**, when the connexion is by means of rough margins, not dentiform, as in the bones of the face.

**Gomphosis**, when one bone is fixed within another, like a nail in a board; as the teeth in the alveoli of the jaws.

**Synchondrosis**, when a bone is united with another by means of an intervening cartilage, as the vertebrae and bones of the pubis.

**Synostosis**, when a bone is connected with another by means of an intervening muscle; as the os hyoides with the sternum.

**Synsarcosis**, when a bone is united to another by an intervening membrane, is the bones of the head of the fetus.

**Symphysis**, when a bone is connected to another by means of an intervening ligament, as the radius and the ulna, &c.

**Synostosis**, when two bones, originally separated, are united to one another by bony matter, as the occipital bone with the spheno-oid.

Synarthrosis

Symphysis

Cartilages are white, elastic, glutinous substances, growing to the bones by a deposition of calcareous matter in their cells. They are divisible into obdient, which cover the articulatory surfaces of bones, interarticular, which are not accreted to the bones, but adhere to

the capsular ligament, and lie between the articulating extremities, as in the knee-joint, &c., and uniting cartilages, which unite bones firmly together, as the symphysis pubis, bodies of the vertebrae, &c.

They lubricate the articulation of the cartilages, to connect some bones by an immovable connexion, and to facilitate the motion of some articulations.

The diseases of cartilages are little, if at all, understood.

The perosteum is a membrane which invests the external surface of all the bones except the crowns of the teeth. It assumes different names in different positions. Thus it is called pericranium, on the cranium, periorbita, on the orbits; perichondrium, when it covers cartilages; and perididymum, when it covers ligaments.

Ligaments, like cartilages, partake of the nature of bones deprived of their calcareous matter, or phosphat of lime. They are elastic and strong membranes uniting the extremities of the moveable bones, and from their form or position are called either capsular or connecting.

The capsular ligaments connect the extremities of the moveable bones, and prevent the efflux of synovia, the external and internal connecting ligaments strengthen the extremities of the moveable bones.

MYOLOGY; OR, DOCTRINE OF THE MUSCLES.

A muscle is a fibrous body for the most part communicating with the sensorium, and producing motion under its influence. It is divided into head, belly, and tail. The head and tail are firmly attached to the bones, the place of attachment of the former is called its origin, it is usually that part nearest the trunk of the body the latter is termed the insertion, which is more remote from the general body, and is implanted into the part to be moved. The body adheres laxly to other parts by means of the cellular membrane, in order that it may swell when the muscle acts.

It is fleshy in its belly, tendinous in its extremities. The former is composed of fleshy fibres, which are irritable and sensible, the latter of white fibres, which are neither sensible nor irritable. When the extremity of a muscle is rounded, it is called a tendon; when broad and expanded, aponeurosis, and sometimes fascia.

Muscles derive their names from the arrangement of their fibres, their action, their origin and insertion, their figure or situation thus, when the fibres of a muscle proceed in the same direction, it is said to be simple, when they are in rays, radiated, when arranged like the plume of a feather, pennisiform, and, when two penniform muscles are contiguous, the union is a compound penniform. Muscles sometimes surround certain cavities of the body, forming a thin lamina, as in the intestinal canal, bladder, &c. When they are situated around any aperture so as to shut or open it, they are termed sphincters. Many muscles are named from their action, as the flexors, extensors, depressors, levators, corrugatores, supercili, &c. The muscles which receive names from their origin and insertion are very numerous, as the sternocleidomastoideus, stylo hyoideus, styloglossus, &c. the deltoid, pectineus, pyramidalis, &c. are named from their figure; and the pectoralis, lingualis, temporalis, pterygoideus, &c. from their situation. Muscles that concur in producing the same action, are called congenetes; and those that act contrary to each other, antagonists. Most muscles are in pairs: those which

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are single are distinguished in the following sketch by an asterisk \*

## *Muscles of the Integuments of the Cranium.*

**Occipito-frontalis\*** — **Epicranius** *Occipitalis et frontalis* **D** *gastrius capitis* — A broad, thin, muscular expansion, arises from the upper ridge of the occipital bone, covers the back part of the head, from the mastoid process of one side around to that of the other side, becomes a flat aponeurosis on the top of the head, and is inserted into the skin and eyebrows, and the bone in that neighbourhood. The use of this muscle is to pull the skin of the head backwards, to raise the eyebrows, and corrugate the skin of the forehead.

**Corrugator supercilii** — Appears like a slip of the former, arises above the root of the nose, and is inserted among the fibres of the occipito-frontalis. Its use is, to wrinkle the eyebrows, by drawing them together.

## *Muscles of the Eyelids*

**Orbicularis palpebrarum** — Arises from, and is inserted by the same small tendon at the inner angle of the orbit. Surrounds the eye, and squeezes it with violence when injured by dust or other substances.

**Levator palpebræ superioris** — Arises by a flat tendon deep within the orbit, near the optic foramen, becomes fleshy as it passes the eyeballs, and ends in the eyelid by a broad expansion of muscular fibres which finally terminate in a short flat tendon. Opens the eye by raising the upper eyelid.

## *Muscles of the Eyeball*

The eyeball is completely surrounded by muscles, which move it in every direction. They arise from the very bottom of the orbit, around the optic foramen, and are implanted into the upper, under, and lateral surfaces of the sclerotic coat of the eye, and the expansions of their colourless tendons form the tunica adnata, or white of the eye. These muscles are termed recti.

**Rectus superior** — *Atollens oculi* **Levator oculi** **Superbus** — Lifts the eye directly upwards, and is expressive of pride and haughtiness.

**Rectus inferior** — *Deprimens oculi* **Humilis** — Directly opposite to the former muscle, and expressive of modesty and submission.

**Rectus internus** — *Adducens oculi* **Bibitorius** — Moves the eye towards the nose.

**Rectus externus** — *Abductor oculi* **Indignabundus** — Turns the eye outwards. When the recti muscles all act in succession they roll the eye, but if they act all at once, the eye is immovable.

Besides these, there are two whose action turns the eye obliquely.

**Obliquus superior** — *Longissimus oculi* **Trochlearis** — Arises with the former, from the bottom of the orbit, by a slender tendon, passes the upper part of the eyeball fleshy, then forms a smooth round tendon, which passes through a cartilaginous pulley in the margin of the orbit, and returns down to be inserted in the middle of the eyeball.

**Obliquus inferior** — *Brevissimus oculi* — Opposed to the former in form, place, and office. Arises from the nasal process of the superior maxillary bone, in the edge of the orbit, and passes obliquely backwards and outwards under the ball of the eye, to be inserted opposite to the obliquus superior.

## *Muscles of the Nose and Mouth*

**Levator labii superioris alæque nasi** — *Pyramidalis* **Dilatator alæ nasi** — Arises by a small double tendon from the nasal process of the superior maxillary bone, spreading, as it passes down the nose, to be inserted by two fascicles, one into the cartilage of the nose and the other into the upper lip. Use, to raise the upper lip, and dilate the nostrils.

**Levator labii superioris proprius** — *Musculus incisivus* — Arises immediately under the edge of the orbit, and above the incisors, by a broad flat origin, and runs downwards and obliquely inwards to the middle of the lip, where it meets its fellow. Pulls the upper lip directly upwards.

**Levator anguli oris** — *Levator labiorum communis* **Cannus** — Origin between the infra-orbital foramen of the superior maxillary bone and the first molaris immediately above the canine tooth. Is inserted into the fibres of the orbicularis oris, at the corner of the mouth, so that it raises the angle of the mouth upwards.

**Zygomaticus major** — *Distortor oris* — Arises from the cheek bone, near the zygomatic suture, runs downwards and inwards to the corner of the mouth, and is lost in the fibres of the orbicularis oris, and depressor of the lip. Its action is that of distorting the mouth in laughter, rage, cunning, &c.

**Zygomaticus minor** — Arises higher than the former from the cheek bone. Is much more slender than the major, and is often wanting.

**Buccinator** — Forms the sides of the cheek. Arises chiefly from the coronoid process of the lower jaw, and from the superior maxillary bone close by the pterygoid process of the sphenoid bone, and proceeds directly forwards to be implanted into the corner of the mouth. In its middle it is perforated by the duct of the parotid gland. Use, to flatten the cheek, assist in swallowing liquids, turning the morsel in the mouth while chewing. In blowing wind instruments, it both receives and expels the wind, hence its name.

**Depressor anguli oris** — *Triangularis labiorum* — Arises fleshy from the edge of the lower jaw. Gradually grows smaller as it runs upwards to be implanted in the angle of the mouth, which it draws downwards. Shape triangular.

**Depressor labii inferioris** — *Quadratus genæ* — Arises under the depressor anguli oris, and goes obliquely upwards and inwards, until it meets its fellow in the middle of the lip, where it mixes with the fibres of the orbicularis. Pulls the lip downwards. Shape square.

**Orbicularis oris\*** — *Constrictor oris* **Sphincter oris** **Osculator** *Semi orbicularis superior et inferior* **Nasalis labii superioris** — Surrounds the mouth after the manner of the orbicularis oculi, and constituting the thickness of the lips. Crosses its fibres at the angles of the mouth, which has induced some to consider it as two semicircular muscles. Often there is a small slip going from the middle of the upper lip to the nose, called *nasalis labii superioris*. Contracts the mouth, and antagonizes with the muscles inserted into it. Shape round.

**Depressor labii superioris alæque nasi** — *Incisivus medius* **Constrictor**, *et compressor alæ nasi* — Very small, concealed under the former. Arises from the socket of the fore teeth, and goes into the root of the cartilage of the nose and upper lip, which it pulls down.

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**Constrictor nasi — Compressor nasi** — A small, slender bundle of muscular fibres which crosses the cartilage of the nose and goes to the very point of the nose, meeting on the top with its fellow.

**Elevator menti — Elevator labii inferioris Incisivus inferior** — Arises from the lower jaw, at the root of the incisor, and is inserted into the skin on the very centre of the chin. Draws the centre of the chin into a dimple, and moves the lip at the same time.

## Muscles of the external Ear

**Superior auris — Attollens** — A very thin flat expansion of muscular fibres, scarcely distinguishable from the fascia of the temporal muscle, upon which it lies. Arises broad and circular from the expanded tendon of the occipito-frontalis and is inserted narrow into the root of the cartilaginous tub. of the ear. Appears to have been intended to lift the ear upwards.

**Anterior auris** — A delicate, thin, narrow expansion, arising from near the back part of the zygoma, and inserted into the eminence behind the helix. Frequently not to be distinguished from the former. Use, to raise the eminence forwards.

**Posterior auris — Retrahens auris Triceps auris** — Small, delicate, thin, arising by three narrow distinct slips from about the mastoid process of the temporal bone, and going directly forwards to be inserted into the concha. Use, to draw the ear back and stretch the concha.

**Helicis major** — Arises from the anterior and acute part of the helix, is inserted into the cartilage of the helix, a little above the tragus. Depresses the upper part of the helix.

**Helicis minor** — Arises lower than the former, and is inserted into the crus of the helix. Use, to contract the fissure.

**Tragus** — Lies upon the concha, and stretches to the tragus. Depresses the concha, and pulls the tragus a little outwards.

**Antitragus** — Very small, lying in the antitragus. Dilates the mouth of the concha.

**Transversus auris** — Arises from the upper part of the concha, and is inserted into the inner part of the helix. Draws these parts together.

## Muscles of the internal Ear

**Laxator tympani** — Arises from the spinous process of the sphenoid bone, and proceeds into the cavity of the tympanum, to be inserted into the long process of the malleus. Use, to draw the malleus obliquely forwards towards its origin.

**Tensor tympani** — Arises from the cartilaginous extremity of the Eustachian tube, within the tympanum, and is inserted into the manubrium of the malleus. Pulls the malleus and membrana tympani backwards.

**Stapedius** — Arises from a little cavern in the tympanum, near the exit of the mastoid process, and passes in a short tube to be inserted into the posterior part of the head of the stapes, which it draws upwards.

## Muscles of the lower Jaw

**Temporales** — Very large, and arises from a semicircular ridge in the lower part of the parietal bone, and from the sphenoid, maxillary, and frontal bones, the hollow behind the eye, where they meet to form the squamous suture, and from the aponeurosis which covers it. They are all directed

together, and pass in a narrow compass under the zygoma to be inserted all around the coronoid process of the lower jaw. Use, to pull the lower jaw upwards, which it does very powerfully.

**Masseter** — Short, thick, fleshy, giving roundness to the back part of the cheek. Arises from the superior maxillary bone, near its junction with the cheek bone, and also from the lower edge of the zygoma, and passes over the coronoid process of the lower jaw, and covers that part of the jaw quite down to its angle, where it is inserted. The parotid gland lies on the upper part of the masseter, and its duct passes over it as it crosses the cheek. Its office is the same as the temporals.

**Pterygoideus internus — Pterygoideus minor** — Arises from the internal or flat pterygoid process of the sphenoid bone, and passes downwards and outwards to be inserted into the angle of the jaw on its inside. Raises the jaw, and draws it a little to one side.

**Pterygoideus externus — Pterygoideus major** — Arises from the external pterygoid process, and passes directly outwards, to be implanted into the lower jaw, just below the capsular ligament, to a part of which it is connected. Use, to move the jaw, and prevent the capsular ligament from being pinched.

## Muscles which appear about the anterior part of the neck

**Platysma myoides** — Musculus cutaneus Latissimus colli. **Quadratus genae** — Delicate, flat, and expanded, arises from the cellular membrane covering the pectoral and deltoid muscles. Its fibres pass upwards to be inserted into the side of the chin and integuments of the cheek. Pulls the skin of the cheeks and face downwards.

**Sterno-cleido-mastoidicus — Sterno-mastoidicus**, and **Cleino-mastoidicus**. **Mistoidicus** — Arises from the upper part of the sternum, and by another head from the first part of the clavicle. These two portions pass upwards and outwards, unite and form a big, strong, round muscle, inserted into the mastoid process. When one of these muscles acts, the head is pulled to one side; but, when both contract together, the head is bent forward.

**Muscles situated between the lower Jaw and os Hyoidis**

**Digastricus — Biventer maxillae inferioris** — Arises fleshy from the notch along the root of the mastoid process of the temporal bone, goes obliquely forwards and downwards, and becomes a long, thick, and round tendon, which perforates the stylo hyoidens muscle, and is affixed by a tendinous bridge to the os hyoides, then turning upwards towards the chin, becomes again fleshy, and is inserted into the lower and anterior part of the chin. When the jaw is fixed, as in swallowing, this muscle raises the os hyoides, but when the os hyoides is fixed, it pulls down the jaw.

**Mylo-hyoidens** — Flat and broad, arising from the whole semicircle of the lower jaw internally, and proceeding with very regular straight fibres to the basis of the os hyoides. Is divided from its fellow by a white tendinous line, which extends from the symphysis of the jaw to the os hyoides. When these muscles contract, the os hyoides is moved upwards.

**Genio hyoidens — Musculus polychrestus** — Arises from the rough point of the chin, and pro-



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ceeds downwards, becoming flat and broad, to be implanted into the base of the os hyoides. When the jaw is fixed, these muscles move the os hyoides forwards and upwards, and when the os hyoides is fixed, they pull the jaw down.

**Gleno-glossus**—Arises by a narrow pointed origin from the rough tubercle behind the symphysis of the chin, spreads out like a fan as it proceeds towards the tongue whose substance it chiefly forms. Moves the tongue in various directions.

**Hyo-glossus**—**Basio-glossus** **Chondro-glossus** **Cerato-glossus**. **Basio-chondro-cerato-glossus**—Arises by three fasciculi (one from the basis, one from the horn, and the other from the cartilage of the os hyoides), which proceed upwards with very slight marks of any division, to be inserted into the sides of the tongue, which they pull downwards, when both act, the tongue is made somewhat round.

**Lingualis**—Arises from, and is inserted into the tongue. It is an irregular bundle of fibres, which runs along the side between the stylo-glossus and the gulo-glossus, unconnected with any bone. The tongue is shortened and drawn backwards by these muscles.

## Muscles situated between the Os Hyoides and Trachea.

**Sterno-hyoideus**—Flat, broad, ribbon-like, arises from the upper part of the sternum, rather within the breast, and partly also from the clavicle and cartilage of the first rib, and goes straight up to be implanted into the base of the os hyoides, which it draws downwards.

**Omo-hyoideus**—**Coraco-hyoideus**—Very long muscle, arising from the scapula near the coracoid process, and passing around the throat to be inserted into the side of the os hyoides. When one of these muscles acts, the os hyoides is pulled to one side, and when both act, it is pulled downwards.

**Sterno-thyroideus**—Lies under the sterno-hyoideus, which it very much resembles, except that it is much shorter. Arises immediately under it, from the sternum and cartilage of the first rib, and goes upwards to be inserted into a rough ridge in the thyroid cartilage, which it pulls down wards.

**Hyo-thyroideus**—**Thyro-hyoideus**—Arises from the basis and horn of the os hyoides, and goes down to be implanted into the lower border of the thyroid cartilage. Raises the thyroid cartilage and depresses the os hyoides.

**Crico-thyroideus**—Passes from the upper edge of the cricoid to the lower margin of the thyroid cartilage. It pulls the thyroid towards the cricoid cartilage.

## Muscles situated between the lower Jaw and Os Hyoides laterally.

**Stylo-glossus**—Arises from the styloid process of the temporal bone, goes obliquely downwards and forwards to be inserted into the back of the tongue in a radiated form, so as to make part of the flesh of the tongue. Its office is to pull the tongue backwards into the mouth.

**Stylo-hyoideus**—**Stylo-hyoideus alter**—Arises, like the former, from the styloid process, and goes obliquely downwards and forwards to be inserted into the side of the os hyoides. Just above its insertion, its fibres are cut so as to form a small loop for the tendon of the digastricus to pass through. Sometimes accompanied by a small

fleshy muscle, called **stylo-hyoideus alter**. Draws the os hyoides upwards.

**Stylo-pharyngeus**—Arises from the root of the styloid process. Long and slender, expanding its fibres upon the side of the pharynx. Lifts the pharynx up to receive the food, and then straightens and compresses it to push the morsel down the oesophagus.

**Circumflexus palati**—**Tensor palati** **Palato-salpingeus** **Staphilius externus** **Spheno-salpingo-staphilius** **Musculus tubæ Pterygo-staphilius**—Arises from the spinous process of the sphenoid bone, and the beginning of the Eustachian tube along, with which it runs down betwixt the pterygoid processes, it then becomes tendinous, and turns around the hamulus of the pterygoid process to ascend again to the side of the velum; hence, when in action, the soft palate is made tense, by being drawn downwards.

**Elevator palati mollis**—**Salpingo-staphilius** **Spheno-staphilius** **Pterygo-staphilius** **Petro-salpingo-staphilius**—Arises from the point of the petrous portion of the temporal bone, from the Eustachian tube, and the sphenoid bone, from which it descends to the velum penulatum palati, and spreads out in it. When these muscles contract, the soft palate is raised against the posterior opening of the nostrils, and the opening of the Eustachian tube, whilst any thing is passing into the pharynx.

## Muscle situated about the entry of the Fauces.

**Constrictor isthmus faucium**—**Glosso-staphilius**—Arises from the very root of the tongue on each side, goes round the middle of the velum, and ends in the uvula. This semicircle forms the first arch which presents itself when looking into the mouth. Its office is to pull down the soft palate, and raise the root of the tongue at the same time.

**Palato-pharyngeus**—**Salpingo-pharyngeus**—Arises in the middle of the soft palate, proceeds around the entry of the fauces, forming the second arch in the mouth, and ends in the edge of the thyroid cartilage. Assists in contracting the arch of the fauces.

**Azygos uvulae**—A slip of straight fibres which goes directly down from the peak of the palata bone to the uvula, which it pulls directly upwards.

## Muscles situated on the sides of the Pharynx.

**Constrictor pharyngis superior**—Arises partly from the thyroid cartilage, and partly from the cricoid cartilage, and meets its fellow in a tendinous middle line. Assists in pushing down the morsel through the pharynx.

**Constrictor pharyngis medius**—Arises from the round point of the os hyoides and its cartilage, and is inserted into the angle of the pharynx, the uppermost part touching the occipital bone. Compresses the pharynx, and at the same time draws the hyoid bone upwards.

**Constrictor pharyngis inferior**—Arises from the basis of the cranium, from the lower margin of the hyoid bone, and from the root of the tongue, and meets its fellow, the upper part of the pharynx, and at the same time moves upwards and forwards, and draws the hyoid bone upwards.

## Muscles situated about the Glottis.

**Cricopharyngeus** **pharyngeus**—Arises broad from the lower part of the cricoid cartilage, and goes upwards to be inserted by a narrow point into the back of the arytenoid cartilage.



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This pair of muscles pulls the arytenoid cartilage directly backwards, and lengthens the rima glottidis.

**Crico-arytænoideus obliquus**—**Crico-arytænoideus lateralis**—Arises from the side of the cricoid cartilage, and goes obliquely to be inserted into the side of the arytenoid. Opens the glottis.

**Thyro-arytænoideus**—Arises from the back of the wing of the thyroid cartilage, from the hollow, and is inserted into the fore part of the arytenoid cartilage. Widens the glottis by pulling the arytenoid cartilage forward.

**Arytænoidæ obliquæ**—Arises from the root of each arytenoid cartilage, and goes obliquely upwards to the points of the opposite one. Draws the cartilages together, and closes the glottis.

**Arytænoidæ transversæ**\*—Arises from the whole length of one arytenoid cartilage, and goes across to be implanted into the whole length of the opposite one. By drawing these cartilages together, the glottis is contracted.

**Thyro-epiglottideus**—Arises from the thyroid cartilage, and is inserted into the side of the epiglottis. Pulls the epiglottis obliquely downwards.

**Arytæno-epiglottideus**—Arises from the upper part of the arytenoid cartilage laterally, and is inserted into the side of the epiglottis, which it moves outwards.

## Muscles situated on the anterior part of the abdomen

**Obliquus externus**—**Obliquus externus descendens** **Obliquus major descendens** **Declivis**—The outermost of all the abdominal muscles, arises by distinct fleshy tongues, from the eight lower ribs. Its fibres pass down in one parallel direction with each other, but oblique with respect to the abdomen. Its fleshy belly ceases about the middle of the side, and becomes a flat tendon, which goes over the fore part of the belly, until it meets its fellow in the middle. This meeting of the tendons, along with that of the other muscles to be described, forms a white line extending from the pubis to the sternum, called *linea alba*. It compresses the abdomen, hence its utility is very considerable in expiration, evacuation of the feces, urine, fetus, &c.

**Obliquus internus**—**Obliquus internus ascendens** **Obliquus minor**—Arises fleshy from all the circle of the spine of the ilium, and by a thin tendon, common with the serratus and latissimus dorsi, from the three lower spinous processes of the loins. From the spine of the ilium it tends upwards in a radiated direction, and crosses the abdomen to the *linea alba*, its higher fibres reaching the sternum, and the lower ones the pubis. Its flat tendon is inserted into the cartilages of all the false ribs, into the sternum, and into the *linea alba*, throughout its whole length. Acts in conjunction with the former.

**Transversarius abdominis**—Arises fleshy from the inner surface of the six lower ribs, from the transverse processes of the four last lumbar vertebrae, from the white line of the ilium, and from part of Poupart's ligament. Its fibres run directly across the abdomen, and are inserted tendinous into the whole length of the *linea alba*. Acts in conjunction with the two former in compressing the abdomen.

**Rectus abdominis**—Covers the fore part of the abdomen, in a line between the sternum and pubis, one muscle on each side the *linea alba*, and is enclosed in this way by a sheath of tendon, formed

by a separation of those of the oblique, which are uppermost, from that of the transversalis, which lies underneath. Origin fleshy from the outside of the sternum, proceeds about four inches in breadth all down the abdomen, and inserted by a short flat-pointed tendon on the side of the symphysis of the pubis. Crossed at intervals by four tendinous intersections. The recti muscles not only compress the abdomen, but bring the trunk forwards towards the pubis.

**Pyramidalis**—Small and triangular, arises from the side of the symphysis pubis, and is inserted a little above into the *linea alba*. Use, to assist the rectus in drawing down the sternum, and tighten the *linea alba*.

## Muscles about the Male Organs of Generation

**Cremaster**—A number of fleshy fibres which arise about the ring and Poupart's ligament, and run downwards to be inserted into the tunica vaginalis testis. When this flat sheet of fibres contract, the testicle is drawn upwards.

**Erector penis**—**Collateralis penis** **Ischio cavernosus**—Lies along the crus penis on each side. Arises by a slender tendon from the tuberosity of the ischium, and goes fleshy, thin, and flat over the crus penis to be inserted about two inches up into the erig. of the penis. The pair is supposed, by pressing the penis against the pubis, to compress the vena magna ipsius penis, and so cause an erection.

**Accelerator urinæ**—**Ejaculator seminis**—Arises from the sphincter of the anus and a little above the bulb of the urethra, and meets its fellow in a white tendinous line along the lower part of the bulb of the urethra, so that they surround the whole of the bulb. Use, to compress the urethra in emptying it of the last drops of urine, and to expel forcibly the semen, which they do with a kind of involuntary or convulsive action.

**Transversalis perinei**—**Transversalis penis** **Transversalis perinei alter**—Arises by a delicate tendon from the tuberosity of the ischium, and crosses the perineum to be inserted into the very back part of the bulb of the urethra. There is occasionally another muscle accompanying it, called *transversalis perinei alter*. Chief use, to prevent the anus being too much protruded in discharging the feces.

## Muscles of the Anus

**Sphincter ani**\*—A broad circular band of muscular fibres surrounding the anus. Arises from a point of the os coccygis behind, and sends a strap forwards, by which it is attached to the back part of the accelerator urinæ. When it contracts, the anus is shut.

**Levator ani**\*—**Musculus ani latissimus**—Arises from the internal surface of the fore part of the pelvis, its origin being continued from the internal pubis all the way round to the sacrum. Grows gradually smaller as it goes downwards to surround the anus, and is inserted into the circle of the anus, the point of the os coccygis, and is mixed with the sphincter ani. Raises the anus, dilates it, and supports it during the evacuation of the feces.

## Muscles of the Female Organs of Generation

**Erector clitoridis**—Small and delicate, arising from the internal part of the crus of the ischium, and inserted into the upper part of the crus, and into the body of the clitoris. Use, to draw the clitoris downwards, and make it tense.

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**Sphincter vaginae** \*—A circular bundle of fibres arising from the sphincter ani and sides of the vagina, which it surrounds, and inserted into the union of the crura clitoridis. It contracts the entrance of the vagina.

## *Muscles situated within the Pelvis*

**Obturator internus**—*Massipialis Bursalis*—Arises from all the internal surface of the obturator ligament, from the edges of the foramen thyroideum within the pelvis, and comes out by turning round the ischium in the notch between the tuberosity and the spine of the ilium, proceeds between the crura of the gemini and its tendon, is united to theirs, and inserted with them by one common tendon into the root of the great trochanter. Rolls the thigh obliquely outwards.

**Coccygeus**—Arises by a narrow point from the inside of the spinous process of the ilium, and is inserted, after being expanded, fleshy into the whole length of the os coccygis. Pulls the point of the os coccygis upwards.

## *Muscles situated within the cavity of the Abdomen*

**Diaphragma** \*—**Septum transversum**—Midriff. A transverse vaulted muscle, dividing the cavity of the thorax from that of the abdomen. Arises by one broad fleshy attachment from all the lower borders of the chest, and this fleshy origin constitutes what is considered by some as the upper or greater muscle of the diaphragm. Arises also by many small tendinous feet from the fore part of the loins, which soon unite in two fleshy bellies, termed the crura diaphragmatis, which, meeting form what is termed the lesser muscle of the diaphragm. The middle of the diaphragm is a strong aponeurosis, and is distinguished by the epithet of centrum tendinosum. The shape of this tendinous centre is determined by the fleshy bellies, the large one above almost surrounds it, and the lesser one below meeting, the larger, the two divisions give it a pointed form behind, not unlike a trefoil leaf, or the act of hearts. The tendinous centre is fixed to the spine, so that the two sides form two convexities in the cavity of the chest.

**Quadratus lumborum**—A flat, oblong, muscle, arising fleshy from the back part of the os ilium and ligaments of the pelvis, which tie the back part of the ilium to the side of the sacrum and transverse processes of the lumbar vertebrae. It goes upwards to be inserted into the points of the transverse processes and the lower edge of the last rib. Supports the loins, and draws the spine to one side.

**Psoas parvus**—A muscle of the loins which arises from the last dorsal and first lumbar vertebrae, and passes down by the side of the psoas magnus to be inserted into the brim of the pelvis, near the acetabulum. Is often wanting. It bends the loins forwards.

**Psoas magnus**—A very long and fleshy muscle filling the space upon the sides of the spine. Arises by an upper head from the last vertebra of the back, then successively from each lumbar vertebra, not only from the sides of their bodies, but likewise from their transverse processes. Then descends thick, round, and fleshy, to be united with the internal iliac muscle, under Poupart's ligament, and the common tendon then bends obliquely round to be inserted into the lesser trochanter. The psoas muscles are in constant use in moving the thigh forwards, and supporting the pelvis upon the thigh-bone.

**Iliacus internus**—Arises from the inner edge of the crista of the ilium, and adheres to the concavity of that bone down to the bump of the pelvis, to the fore part of the bone under the spinous process. All its radiated fibres are gathered to each other into a tendon under Poupart's ligament, where it unites with the psoas, and the common tendon turns obliquely round to be inserted into the lesser trochanter. Acts in conjunction with the psoas in moving the thigh forwards.

## *Muscles on the anterior part of the Thorax*

**Pectoralis major**—A large, thick, and fleshy muscle which covers all the breast. Arises from the clavicle next the sternum, from the edge of the sternum and the cartilaginous endings of the fifth and sixth ribs. All its fibres converge to form a flat twisted tendon, which goes before the armpit to be inserted into the edge of the groove in the humerus for the tendon of the biceps. When this muscle contracts, the arm is brought forwards obliquely.

**Subclavius**—**Subclavianus**—A small muscle concealed under the clavicle. Arises by a flat tendon from the cartilage of the first rib and is inserted fleshy into a great part of the clavicle. Use to fix the clavicle more firmly.

**Pectoralis minor**—**Serratus minor anticus**—Lies underneath the pectoralis major, close upon the ribs. Arises thick and fleshy from the third, fourth, and fifth ribs, its fibres all converge to form a thick fleshy point, to be inserted into the very apex of the coracoid process of the scapula. Pulls the scapula directly forwards.

**Serratus major anticus**—Covers the side of the chest. Arises by sharp pointed slips or digitations from all the true ribs except the first, and from three of the false ribs. Proceeds upwards and backwards to form a fleshy cushion as it were, for the scapula, and its fibres all converge to be inserted into the basis of the scapula. Pulls the scapula downwards and forwards.

## *Muscles between the Ribs, and within the Thorax*

**Intercostales externi**—Forming an external layer of muscular fibres between the ribs. They run from the spine towards the sternum.

**Intercostales interni**—Running from before backwards underneath the former, and crossing them. Both assist inspiration by raising the ribs.

**Sterno costalis**—**Transversus sterni**—Three or four slips of muscles, arising from the ensiform cartilage, and going over the middle of the sternum to be inserted into the second, third, and fourth rib. Its office is to depress the rib.

## *Muscles on the anterior part of the Neck close to the Vertebrae*

**Longus colli**—One layer formed by four muscles. Arises, within the thorax, from the first part of the bodies of the three uppermost cervical vertebrae, and from the transverse processes of the four last vertebrae of the neck, and is inserted into the fore part of the second cervical vertebra, where the opposite large muscles meet. Pulls the neck to one side, and, with its fellow, the head and neck directly forwards.

**Rectus internus capitis major**—Arises from the transverse processes of the five lower cervical vertebrae, and proceeds obliquely to be inserted into the spinous process of the occipital bone, just before the foramen magnum occipitale. Pulls the head and neck directly forwards.

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**Rectus internus capitis minor**—Very small, and immediately underneath the former. Arises from the fore part of the atlas, and goes obliquely inwards to be inserted into the occipital bone, near the condyle. Assists the former.

**Rectus capitis lateralis**—Very small, like the former. Arises from the transverse processes of the atlas, and is inserted into the side of the cuneiform processes of the os occipitis. Lies immediately under the exit of the internal jugular vein. Moves the head to one side, and, when both act, they assist the former muscles in pulling the head forwards.

## *Muscles on the posterior part of the Trunk*

**Trapezius**—**Cucullaris**—These cover the back part of the neck and shoulders, extending from the tip of one shoulder to the tip of the other, and from the nape of the neck quite down to the loins, hence it has been compared to a monk's cowl hanging back upon the neck. Each arises by a strong tendon from the most pointed part of the os occipitis, and along the transverse spine to the mastoid process from this point, all down the neck, it has no hold of the vertebrae, but arises from the ligamentum nuchae. It then arises from the spines of the two last cervical vertebrae, and those of the back. From this long origin, its fibres converge into one point, the tip of the shoulder, to be inserted into the scapular end of the clavicle, the acromion of the scapula, and the whole length of its spine. The trapezius is chiefly a muscle of the scapula: it also bends the neck and head backwards.

**Latissimus dorsi**—The broadest muscle of the whole body.—Covers all the lower part of the back and loins. Arises by a broad flat tendon in the middle of the back, loins, and sacrum, and fleshy from the circle of the ilium. The tendon gradually becomes a flat regular muscle; proceeds upwards, passes over the corner of the scapula, from which it receives a small fleshy bundle, and several smaller ones as it passes over the ribs; then becomes a twisted tendon, passes into the axilla, and turns under the os humeri to be inserted into the inner edge of the groove of the corner of the biceps. Thus it appears that the anterior part of the axilla is formed by a very powerful major, and the posterior by the latissimus dorsi; hence they support the whole arm, and on crutches. The latter muscle brings the arm down, when raised, as in striking with the hammer; and downwards and backwards, as in knocking with the elbow, it also turns the palm of the hand behind the back.

**Serratus inferior**—Very broad and thin, situated in the lower part of the back, under the latissimus dorsi, arises from the three lower dorsal and four lumbar vertebrae. Soon becomes fleshy, and divides into three or four slips, each of which passes obliquely into the ninth, tenth, eleventh, and twelfth ribs, near their cartilages, and moves them forwards and backwards.

**Serratus major et minor**—The serratus major arises from the angle of the scapula, and passes between the spine and the scapula, and is inserted into the spinous processes of the seven lower ribs, and goes across to be inserted into the transverse process of the basis of the scapula, and passes between the spinous processes of the four last dorsal vertebrae, and is inserted into the lowermost rib, and the basis of the scapula: generally considered as one muscle, though at times there is a distinct

union, and most frequently only a partial one: use to move the scapula upwards and backwards.

**Splenius**—**Splenius capitis**, **Splenius colli**—Lies immediately under the trapezius and above the complexus, and is named splenius, from its lying like a surgical splint along the side of the neck. Flat and broad, arising from the four uppermost spinous processes of the back and five lowest of the neck, proceeds upwards and outwards to be implanted into the whole length of the occipital ridge, and mastoid process of the temporal bone. Immediately under this portion is another arising with it, but terminating by four or five distinct tendons in the transverse processes of the upper cervical vertebrae. This portion is considered by some as a distinct muscle, and called splenius colli, and the former splenius capitis. When the muscles of one side act, the head is pulled backwards to one side; when both act, it is drawn directly backwards; and when the muscle of one side with the sternocleidomastoides of the same side act together, the ear is brought down upon the shoulder.

**Serratus superior**—On the posterior part of the chest, over the splenius. Arises from a flat and shining tendon from the spinous process of the fourth cervical and two uppermost dorsal vertebrae, and goes obliquely downwards under the upper corner of the scapula to be inserted into the second, third, and fourth ribs, by three fleshy digastrons. They elevate the ribs.

**Spinalis dorsi et cervicis**—One long mass of muscular and tendinous fibres, going from spine to spine along the whole length of the back and neck. Raises the spine.

**Levatores costarum**—**Supra costales** **Levatores costarum longior**—Twelve on each side, for the direct purpose of raising the ribs. Arise from the transverse processes of the last cervical and eleven uppermost dorsal vertebrae, and go down to the angle of each rib. The three last are twice as long as the others.

**Sacro lumbalis**—**Addamentum ad sacro lumbalem Musculum accessorium**—Arises by a tendon common to it and the longissimus dorsi, from all the spinous processes of the lumbar vertebrae from the spines of the sacrum, and back part of the os ilium. Just opposite the lowest rib the tendons separate, and the sacro lumbalis goes away to be inserted by a flat tendon into each rib. From the surface of the six or seven lowest ribs arises a small slip, which mixes with the substance of this muscle: these slips are termed addamenta ad sacro-lumbalem, and sometimes musculi accessorii. There is also a fleshy slip connected with the sacro-lumbalis, sometimes described as a distinct muscle, when it is termed cervicalis descendens.

**Cervicalis descendens**—Connected with the former, arises from the transverse processes of the five lower cervical vertebrae, and passes downwards small and slender to be inserted into the six uppermost ribs. Turns the neck obliquely backwards, and to one side.

**Longissimus dorsi**—Round, thick, and firm, filling up the hollow betwixt the spine and the angle of the ribs. Arises by a tendon common to it and the former muscle, and is implanted by two distinct sets of insertions into the heads of the ribs and the transverse processes of the vertebrae. Chief use to assist in returning the spine to the erect posture, and to keep it erect.

**Transversalis colli**—Arises from the five uppermost transverse processes of the dorsal vertebrae, and

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passes upwards to be inserted into the transverse processes of the neck.

**Complexus—Implicatus Trigemini** Biventer cervicis. **Complexus major**—So called from the intricacy of its muscular and tendinous parts. Lies immediately under the spleenius, and arises by ten or more tendinous feet from the transverse processes of the four lower cervical and seven uppermost dorsal vertebra. It then becomes a large, thick, fleshy, and tendinous mass, filling up the hollow by the sides of the cervical spinous processes, and terminates by a broad fleshy head in the lower occipital ridge. Draws the head backwards.

**Trachelo-mastoides**—**Complexus minor** Mastoideus lateralis.—Arises from the transverse processes of the three first vertebrae of the back and the five lowest of the neck, and is inserted into the mastoid process. When one muscle contracts, the head is drawn obliquely backwards, and when both act together, it is pulled directly backwards.

**Levator scapulae**—**Levator proprius angularis** Musculus petrius.—A small thin muscle which arises from the transverse processes of the four or five uppermost vertebrae of the neck, by as many distinct heads, which soon unite, and the muscle goes downwards to be inserted into the upper part of the scapula by a thin tendon. It pulls the scapula up, as in shrugging the shoulders.

**Semi spinalis dorsi**—**Transversospinalis dorsi**—Arises from the transverse processes of the seventh, eighth, ninth, and tenth dorsal, and is inserted into the spinous processes of the four uppermost and last cervical vertebra. Extends the spine obliquely backwards.

**Multidus spinæ**—**Semi-spinalis internus**, five transversospinalis dorsi. **Semi spinalis**, five transversospinalis colli, pars interna. **Transversalis humerorum, vulgo sacri** Transversalis dorsi. **Transversalis colli**—The many irregular portions of muscle, which authors have variously described, running from the sacrum all along the spine to the vertebrae of the neck, are comprehended under the name of **multidus spinæ**. Begins tendinous and fleshy from the upper part of the sacrum, from the oblique processes of the lumbar vertebrae, from the transverse processes, and from the oblique processes of the cervical vertebra, and its many bundles are inserted into the spinous processes of the third or fourth, above that from which the bundle arose. These muscles prevent the spine from being too much bent forwards, and also move the spine backwards.

**Spinalis cervicis**—**Semi spinalis colli** Transversospinalis colli.—Arises from the transverse processes of the six uppermost dorsal vertebra, and is inserted into all the spinous processes of the cervical vertebra, except the first and last. Struts the neck obliquely backwards.

**Rectus capitis posterior major**—Arises tendinous from the transverse process of the second cervical vertebra, and mounts up fleshy to be inserted into the lower occipital ridge. Draws the head backwards.

**Rectus capitis posterior minor**—A shorter muscle than the former, arising tendinous from the middle of the first vertebra of the neck, and is inserted fleshy with the former into the lower occipital ridge. Its action assists that of the major.

**Obliquus capitis superior**—The oblique muscles very much resemble the recti, except in the direction. This arises from the transverse process of the atlas, and goes obliquely to be inserted

into the end of the lower occipital ridge. Assists in turning the head.

**Obliquus capitis inferior**—Arises from the spinous process of the second cervical vertebra and is inserted into the transverse process of the atlas. Assists in turning the head quickly.

**Scalenus**—**Scalenus, primus et secundus**—The ancients considered this as one triangular muscle. It has since been distinguished as two, the first and even five distinct muscles. It is, in fact, the great, flat, triangular muscle, situated between the ribs to the neck, closing the thorax above, and giving passage to the nerves and vessels of the arm. Arises from the transverse process of the six lower cervical vertebra, one part of it is inserted into the flat part of the first rib close to its cartilage, another into the whole length of the outer edge of the first rib, and a third portion into the upper part of the second rib. Moves the head backwards, or pulls the neck to the side.

**Interspinalis**—**Interspinalis, dorsalis, et lumborum**—The interspinalis dorsalis, consists of numerous fibres that pass from one spinous process to the next through, but not over, the interspinalis, in the back, the lower is, in the loins, tenacious, or ligamentous, draw the spinous processes towards each other.

**Intertransversales**—Small muscles, the strongest where they are most numerous, situated between the transverse processes of the same Dorsal these parts to the side.

## Muscles of the Superior Extremities

**Summa-spinatus**—Occupies the hollow of the scapula above its spine. Arises from the back spine and edge of the scapula, very thick and fleshy, and is enclosed by an aponeurosis that along the scapula under the acromion, and then becomes a tendon, which passes over the head of the humerus, to be inserted into the crest of the shaft of the humerus. Raises the arm directly upwards.

**Infra-spinatus**—Arises from the thick, and lower margin of the scapula, upper part of the cavity below the spine of the scapula, is covered with a strong, aponeurosis, and is a thin muscle. Becomes perfectly tendinous at the capsular ligament of the shoulder joint, to which it is attached, and then passes over it to be inserted into the greater tuberosity of the humerus. Assists the former.

**Teres minor**—Is closely connected to its origin with the infra-spinatus, long, small, and fleshy, arises from the angle and all the lower edge of the scapula, and accompanying the infra-spinatus to be attached to the capsular ligament, and then inserted into the great tuberosity of the os humeri. Assists the former muscles in raising the arm.

**Teres major**—Thicker and longer than the former, situated below it, arises chiefly from the angle of the scapula, and is closely connected with the teres minor and infra-spinatus. Its tendon passes under the long head of the biceps, and is inserted into the ridge on the inner side of the groove along with the tendon of the biceps dorsi. Chiefly used to draw the arm downwards and backwards.

**Deltoides**—Thick and fleshy, covers the top of the shoulder. Arises from the outer end of the clavicle, from the point of the acromion of the scapula, and the spine of the scapula. Its muscular fibres converge over the shoulder, and form a large strong tendon, inserted into the os brachii, and third down. Use, to raise the arm.

**Coraco-brachialis**—Musculus perforatus. Co-

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**Coraco-brachialis**—Long and rather slender, named from its origin and insertion. Arises fleshy from the coracoid process of the scapula, along with the short head of the biceps, which it accompanies, and is inserted by a short tendon into the middle of the os brachii. Raises the arm obliquely forwards and upwards.

**Subscapularis**—Lines all the convexity of the scapula, shape triangular, is fleshy, thick, and strong, its fibres converge from their origin in the two edges and base of the scapula, to form a tendon whence it has a radiated or fan like appearance. The tendon accompanies that of the supraspinatus and goes round the head of the humerus to be inserted into the lesser tuberosity of the os brachii. Rolls the arm inwards.

## Muscles on the os brachii

**Biceps flexor cubiti**—Biceps. Biceps flexor brachii—Very thick and strong, situated in the fore part of the arm. Arises by two distinct heads, one larger and thicker head, proceeds by a long tendon from the coracoid process of the scapula, the other, shorter, arises from the edge of the glenoid cavity of the scapula. About one third down the arm the two heads meet, and form a firm fleshy belly, which terminates in a tendon implanted into the tubercle on the fore part of the radius, a little below its neck. Sends off an aponeurosis just above the flexure of the arm to bind the fore arm with great strength.

**Brachialis internus**—Lies immediately under the biceps, which it assists. Arises by a forked head from two thirds of the os brachii at its fore part and continues its attachment all the way down to within an inch of the joint. Is inserted by a flat tendon into the coracoid process of the ulna.

**Triceps extensor cubiti**—Extensor longus. Extensor brevis. Brachialis internus. Situated on the back part of the arm, and was formerly described as three distinct muscles, arises by a long tendon from the edge of the scapula, by an outer head from the os brachii, just under the greater tuberosity, and by an internal head, which is the shortest, from the inside of the os brachii, just under the insertion of the teres major. All these heads unite and are continued downwards, adhering to the os brachii, to within an inch of the joint, where a strong, thick tendon is formed, which is implanted into the olecranon. Extends the fore arm with considerable force.

**Anconeus**—Small and triangular placed on the back part of the elbow. Arises from the external condyle of the os brachii, and is inserted into the back part or ridge of the ulna. Assists in extending the fore arm.

## Muscles situated on the fore arm

**Supinator radii longus**—Forms the very edge of the fore arm, arises from the edge above the external condyle of the os brachii, becomes very fleshy as it passes the elbow joint, then tendinous and long, and is inserted into the radius near the styloid process. Assists in turning the palm of the hand upwards.

**Extensor carpi radialis longior**—Arises from the ridge of the os brachii just above the external condyle, having become a thick fleshy belly, passes along the back of the radius, and forms a thin tendon, which passes over the wrist under the annular ligament, and is inserted into the root of the metacarpal bone of the fore finger. Extends the wrist.

**Extensor carpi radialis brevior**—Almost the same in origin and use with the former. Inserted into the fore part of the metacarpal bone of the middle finger.

**Extensor digitorum communis**—Covers the middle of the back part of the fore arm, and between the extensor radialis secundus and the extensor minimi digiti. Arises from the outer condyle of the humerus, grows very fleshy and thick as it descends, and about the middle of the forearm divides into three slips. The tendons pass under the annular ligament, along the metacarpal bones and first phalanx of the fingers, where they are joined by those of the interossei and lumbricales, and form a tendinous sheath, which surrounds the back of all the fingers. Extends the fingers.

**Extensor minimi digiti**—Auricularis—Raises the little finger, as in picking the ear. Arises from the outer condyle of the humerus, and accompanies the extensor digitorum communis, passes under the annular ligament in a channel peculiar to it. Is inserted into the second joint of the little finger.

**Extensor carpi ulnaris**—Arises from the external tubercle of the humerus, and proceeds along the ulnar edge of the arm to be affixed tendinous into the outside of the lower head of the metacarpal bone of the little finger. Use, to extend the carpus.

**Flexor carpi ulnaris**—Arises tendinous from the inner condyle of the os humeri, and fleshy from the olecranon, proceeds fleshy along the lower edge of the arm, about the middle becomes tendon, and is inserted into the os pisiforme. The flexor carpi radialis with this muscle bend the wrist with great force, alone it pulls the hand sideways.

**Palmaris longus**—Long and thin, arises from the internal condyle of the os humeri, forms the slender tendon and passes along the middle of the forearm to be inserted into the annular ligament, just under the root of the thumb. Expands into an aponeurosis, and covers and protects the muscles and blood vessels of the hand. Bends the hand.

**Flexor carpi radialis**—Long and thin, arises by a short split tendon, from the internal condyle of the humerus, proceeds fleshy along the middle of the forearm in the course of the radius. Its thin tendon passes under the annular ligament in a groove peculiar to itself, to be inserted into the metacarpal bone of the fore finger. Bends the wrist.

**Pronator radii teres**—Small and round, arises from the internal condyle of the humerus, and from the coranoid process of the ulna. Fleshy, and of a conical shape, stretches obliquely across the arm to be inserted into the outer ridge of the radius, about the middle of its length. Turns the hand downwards.

**Supinator radii brevis**—Short, thick, and fleshy, arises from the external condyle of the os brachii, from the edge of the ulna, and from the interosseous ligament, is turned over the radius to be inserted into its ridge. Rotates the radius outwards.

**Extensor ossis metacarpi pollicis manus**—Extensor primus pollicis. Extensor primus intermedium. Abductor longus pollicis manus—Crosses the fore edge of the radius, arises from the edge of the ulna, about the middle of the arm. Divides into two, three, or four slips, with distinct tendons, which go under the ligament of the carpus to be

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inserted into the root of the first metacarpal bone of the thumb Use to extend the thumb

**Extensor polli internodu**—**Extensor minor pollicis manus** **Extensor pollicis primus** **Extensor secundi internodu** **Extensor secundus pollicis**—Lies close to the former, arises just below it and accompanies it under the ligament of the wrist, passes on to be inserted into the first phalanx of the thumb, which it extends

**Extensor secundi internodu**—**Extensor major pollicis manus** **Extensor pollicis secundus** **Extensor tertii internodu** **Extensor tertius pollicis**—Thick and fleshy arises higher than the former on the ulna, and passes straight down that bone Its tendon passes the ligament of the wrist in a peculiar ring, and proceeds to be inserted into the last bone of the thumb which it extends

**Indicator**—**Extensor indicis proprius** Arises from the ridge of the ulna, is attached to the interosseous ligament its tendon passes under the annular ligament, and joins with the indicator tendon of the common extensor Extends all the three joints of the fore finger

**Flexor digitorum sublimis**—**Perforatus**—Large and fleshy, lies between the palmaris longus and flexor ulnaris, arises from the internal condyle of the os brachii, from the ligament of the elbow joint the coronoid process of the ulna, and from the upper part of the radius Divides about the middle of the forearm into four fleshy slips, each of which gives off a slender tendon, which passes under the annular ligament, to be inserted, after being perforated in the first phalanx of the fingers by the tendons of the flexor digitorum profundus, into the fore part of the second phalanx Use, to bend the first and second phalanges

**Flexor digitorum profundus**—**Perforans**—Lies deeper than the former which it accompanies Arises from the internal surface of the ulna and interosseous ligament, divides into four slips, the tendons pass under the annular ligament, perforate those of the flexor sublimis, and are inserted into the fore part of the last phalanx of the fingers Bends the last joint of the fingers

**Flexor longus pollicis**—Arises by the inside of the radius arising from it, and the interosseous ligament, occasionally by another head from the condyle of the humerus and fore part of the ulna Passes under the annular ligament, and is inserted into the last bone of the thumb Bends the thumb

**Pronator radii quadratus**—Lies flat upon the interosseous ligament in the fore part of the arm, about two inches above the wrist Nearly square, its fibres go across between the radius and ulna Turns the radius upon the ulna

## Muscles situated chiefly on the Hand

**Lumbricales**—**Musculi fiduciales**—Four small round muscles, resembling earth worms Arise in the palm of the hand, from the tendons of the profundus their small tendons reach the middle of the second phalanx Chiefly useful in performing the quick short motions of the fingers on musical instruments, &c

**Flexor brevis pollicis manus**—Two-headed on the inside of the thumb, one head arises from the os trapezium, the other from the os magnum Inserted into the sesamoid bones and edge of the first bone of the thumb Use, to bend the first joint of the thumb

**Opponens pollicis**—Lies under the abductor pollicis, arising from the os scaphoides and ligament of the wrist is inserted into the fore part

of the metacarpal bone of the thumb Bends the thumb, as in clenching the fist

**Abductor pollicis manus**—Lies immediately under the common integuments arises from the annular ligament of the wrist and the os scaphoides, bends gradually round the thumb to be inserted into the first bone of the thumb A second muscle is described, by Albinus, by the same name Pulls the thumb from the fingers

**Abductor pollicis manus**—The metacarpal bone of the middle finger gives origin to this triangular muscle, goes directly across to meet the thumb, and is inserted into the root of the first phalanx Draws the thumb towards the fore finger

**Abductor indicis manus** Flat and broad arises from the os trapezium and the first bone of the thumb and is inserted into the back part of the first bone of the finger, which it pulls towards towards the thumb

**Palmaris brevis**—**Palmaris cutaneus** arises from the palmi aponeurosis and stretches across the hand to be inserted into the metacarpal bone of the little finger, and the supernumerary fit Stretches the aponeurosis of the palm of the hand

**Abductor minimi digiti manus**—Thin and fleshy, the hand rests upon it in writing Arises from the os pisiforme and the outer end of the annular ligament and is inserted laterally into the first bone of the little finger Draws the little finger away from the rest

**Abductor minimi digiti**—Arises from the ligament of the wrist and coniform bone, and turns round the metacarpal bone of the little finger to be inserted into the outside of it Pulls the metacarpal bone of the little finger towards the thumb

**Flexor parvus minimi digiti**—Arises from the ligament of the wrist and coniform bone, and accompanies the abductor minimi digiti and has nearly the same insertion Bends the little finger

**Interossei externi et interni**—Small muscles lying between the metacarpal bones and assisting the lumbricales in bending the fingers

## Muscles of the inferior extremities

**Pectinalis**—**Pectinæus**—Flat and square, lies under the skin, and arises from the os pubis, or pectinus, as it forms the brim of the pelvis, immediately above the foramen thyroideum, proceeds downwards to be inserted by a long flat tendon into the linea aspera of the thigh bone just below the little trochanter Use, to bring the knees together, to raise the thigh upwards, and give it a degree of rotation outwards

**Triceps adductor femoris**—Broad, flat, and triangular, usually described as three muscles, under the names of adductor longus, adductor brevis, adductor magnus

The use of all these is to bring the thigh forwards and upwards

**Obturator externus**—So named from its origin Arises from the obturator ligament, and from the ramus ischi and pubis, forming the sides of the thyroide foramen Its fleshy fibres are soon gathered into a round tendon, which twists under the os femoris to be inserted into the cavity at the root of the great trochanter Use, to roll the thigh obliquely outwards

**Gluteus maximus**—**Gluteus magnus** **Gluteus major**—Lies immediately under the skin, upon the posterior part of the thigh, upon which it sits, arises fleshy from the posterior half of the



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spine of the ilium, from the junction of the ilium and sacrum from the whole external surface of the sacrum, and from the sacro-sciatic ligament. The fibres run obliquely forwards and downwards to the thigh-bone, are gathered into a broad tendon, and implanted into the great trochanter, and about three inches along the linea aspera. Extends the thigh, by pulling it directly backward and a little outward.

**Gluteus medius**—Lies immediately under the former, arises from the anterior half of the spine of the ilium, and from its anterior superior spinous process. Its fibres converge towards the great trochanter into which the muscle is inserted by a broad tendon. Use to draw the thigh outwards and a little backwards, and to roll the thigh outward, especially when it is bent.

**Gluteus minimus**—**Gluteus minor**—Arises from the middle of the external surface of the ilium from a ridge continued from the anterior superior spinous process. Tendon inserted into the fore and upper part of the great trochanter. To assist the other glutei muscles.

**Piriformis**—**Iliacus externus** **Pirivalis**—Named from its shape, arises by three fleshy and tendinous beginnings from the hollow of the sacrum and sacro-sciatic notch, and growing gradually narrower, passes between the gluteus minor and gemini, its round tendon inserted into the upper part of the cavity, at the neck side of the root of the great trochanter. Use to move the thigh upwards and roll it outwards.

**Crimini**—**Cemelli**—**Bicipitate**, and often taken for two muscles. The uppermost, or the larger and stronger head, arises from the spinous process of the ischium, the smaller head from the outer end of the tuberosity of the ischium. Both fleshy in their whole length, and, meeting, form a tendon to be inserted into the root of the great trochanter. Rolls the thigh-bone outwards.

**Inductus femoris**—Passes in a transverse direction between the tuberosity of the ischium and the thigh bone. Arises from the outside of the tuberosity of the ischium, and is inserted into the ridge between the large and little trochanters. Rolls the thigh outwards.

## Muscles situated on the thigh.

**Tensor vaginus femoris**—**Vasculis** **Musculus aponeurosis, vel fascia lata**—Arises from the anterior superior spinous process of the ilium by a narrow tendinous and fleshy slip; whence it proceeds to be inserted into the inside of the fascia of the thigh, which it stretches.

**Sartorius**—Extends long and obliquely across the whole thigh. Arises tendinous from the anterior superior spinous process of the ilium, then becomes fleshy, somewhat like a strap, and runs round the thigh to be inserted into the head of the tibia by a tendon.

Use, in bending the leg obliquely outward, and in bringing one leg across the other, as when a tailor sits, whence its name, which signifies the tailor's muscle.

**Gracilis**—**Gracilis femoris** **Rectus internus femoris**—Small, thin, and flat, arises tendinous from the pubis, near the lesser trochanter, and passes directly under the integument to the knee, to be inserted under the sartorius into the side of the head of the tibia. Assists the sartorius in bending the leg.

**Rectus femoris**—**Rectus cruris** **Rectus gracilis anterior**—Arises from the anterior superior spinous process of the ilium by a short round

tendon, and from the edge of the acetabulum and capsular ligament forms a flat tendon, which soon becomes fleshy, and passes directly downwards to the patella. Is united at the sides to the vasti, at the back part to the crureus. Its tendon, with that of the crureus, is implanted into the patella. Assists in extending the leg, in a very powerful manner.

**Vastus externus**—Arises by a thick and strong tendon from the root of the great trochanter and upper part of the linea aspera, passes down the thigh, attached to the crureus, and forms a flat tendon, which embraces the patella, and goes round the head of the tibia to be inserted into the inner side of the knee. Extends the leg.

**Vastus internus**—Resembles the former but not so large. Arises tendinous and fleshy from the fore part of the little trochanter, and from the whole of the linea aspera runs obliquely forwards and downwards, accompanying the crureus, its tendon surrounding the knee-joint to be inserted into the outer part of the head of the tibia. Assists the externus in extending the leg.

**Crureus**—**Cruralis**—Rises from the little trochanter, and nearly the whole of the forepart of the os femoris. On its outer edge and fore part united to the vastus externus; on its inner edge and fore part to the vastus internus. At its lower part is joined to the tendon of the rectus, and forms one tendon, inserted into the patella.

**Subcrureus**—Two little muscular slips sometimes found under the crureus, they are inserted into the capsular ligament which they pull up. The crureus assists in extending the leg.

**Semitenidinosus**—**Seminervosus**—Arises tendinous and fleshy from the posterior portion of the tuberosity of the ischium, and continues a little way connected with the biceps cruris, then leaves it, and goes obliquely inwards to form a long tendon, which passes down behind the inner tubercle of the knee to be inserted into the inside of the tibia, a little below its tuberosity. Use, to bend the leg backwards and a little inwards.

**Semimembranosus**—Begins and ends by a flat tendon, somewhat like a membrane, arises by a broad, thin, flat tendon from the fore part of the tuberosity of the ischium and terminates in a short tendon, inserted behind the head of the tibia, with the tendon of the semitenidinosus, forms the inner ham-string. Use, to bend the leg, and bring it directly backwards.

**Biceps flexor cruris**—**Biceps cruris** **Biceps**—So named from its two heads; lies immediately under the skin in the back part of the leg, arises tendinous from the outer part of the tuberosity of the ischium, with the semitenidinosus. The short head begins from the linea aspera, and continues down to its bifurcation. A little above the condyle of the femur the two heads unite, and proceed to be inserted into the head of the fibula, forming the outer ham-string. Use to bend the leg.

**Popliteus**—Small and triangular, lying across the back part of the knee-joint. Arises from the outer condyle of the femur, and inserted into a ridge on the back part of the tibia. Assists in bending the leg, and prevents the capsular ligament from being pinched.

## Muscles situated on the leg.

**Gastrocnemius externus**—**Gemellus**—Large, fleshy, and forms the calf of the leg. Arises by two heads from the external and internal condyle of the femur, the two heads meet, and run down the calf with the appearance of a raphe between;



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they then form a flat tendon, very broad at its commencement, which passes down the leg, and unites with the tendon of the gastrocnemius internus a little above the ankle

**Gastrocnemius internus**—**Soleus** **Extensor tarsi suralis**—Arises, like the former, by two heads the one from the back part of the head of the fibula, the other from the posterior and upper part of the tibia these immediately unite, and form a large fleshy belly About half way down the leg it becomes tendinous, and soon unites with the tendon of the gastrocnemius externus From this union is produced the tendo Achillis, which inserts both muscles into the extremity of the os calcis

**Plantaris**—**Fibialis gracilis**, vulgo **plantaris** **Extensor tarsi minor**, vulgo **plantaris**—Long and slender, arises fleshy from the external condyle of the femur, and adheres firmly to the capsular ligament of the knee forms a small flat tendon, which runs between the inner head of the external gastrocnemius, and the soleus, to be attached to the tendo Achillis, with which it is inserted into the inner side of the os calcis Use, to prevent the capsular ligament of the knee-joint from being pinched, and to assist the gastrocnemii muscles

**Tibialis anticus**—Arises from the fore part and outside of the tibia, just under the head of that bone About two thirds down the bone it becomes tendon, which passes obliquely over the leg, crosses the ankle, and goes under the annular ligament to be inserted into the upper and inner part of the os cuneiforme internum, and metatarsal bone of the great toe Extends the foot, and turns the toes inwards

**Tibialis posticus**—Arises from the back part and ridge of the tibia, from the opposite part of the fibula, and from the interosseous ligament quite down to the ankle About the middle of the tibia becomes tendinous and fleshy, passes in a groove at the inner ankle, and expands so as to grasp the bones of the tarsus, is inserted into the two first metatarsal bones, os calcis, and os cuboides Its contraction pulls the foot in, so as to put the toes together

**Peroneus longus**—**Peroneus maximus**, vulgo **peroneus posterior** **Peroneus primus**, seu **posticus**—Arises from the fore part of the head of the fibula, and has a small slip from the upper part of the tibia About the middle of the leg its tendon emerges towards the integuments, and passing the outer ankle in a cartilaginous pulley which also transmits the peroneus brevis, is reflected to the sinuosity of the os calcis, and runs along a groove in the os cuboides to be inserted tendinous into the outside of the root of the metatarsal bone of the great toe, and the os cuneiforme internum Moves the foot forwards, and assists in extending it

**Peroneus brevis**—**Peroneus medius**, vulgo **peroneus anticus** **Peroneus secundus**, seu **anticus** Arises fleshy from above the middle of the external part of the fibula, all the way down to the ankle, adheres also to the tendinous partition between it and the common extensors Its tendon passes under that of the peroneus longus, by the outer ankle, to be inserted into the metatarsal bone of the little toe Assists the former in pulling the foot outwards, and extending it

**Extensor longus digitorum pedis**—**Extensor longus** **Peroneus tertius** **Nonus Vernali**—A common extensor of the toes Arises from the outer and fore part of the head of the tibia, just below the knee From the head of the fibula, the interosseous ligament, and the tendinous fascia of the leg, becomes a thick fleshy muscle, and is di-

vided into three distinct portions, which form three round tendons that pass obliquely inwards under the annular ligament of the tarsus where the first portion divides its tendon into two These four tendons are inserted first into the root of the first joint of each of the four small toes, expanding along the upper side as far as the root of the last joint A portion of this muscle also arises from the middle of the fibula, and sends its fleshy fibres forwards to a tendon which goes under the annular ligament to be inserted into the root of the metatarsal bone of the little toe This portion is termed, by Albinus, **peroneus tertius**

**Extensor proprius pollicis pedis**—**Extensor longus**—An extensor of the great toe Arises by an acute, tendinous, and fleshy beginning, from the head of the fibula continues slender down the fibula, and its tendon passes under the annular ligament to be inserted into the posterior part of the last and first joint of the great toe

**Flexor longus digitorum pedis**—**Profundus** **Perforans**—Arises from nearly the whole of the back part of the tibia When the ankle becomes tendinous, crosses the tendon of the tibialis posticus behind the ankle joint, goes forward in a groove of the os calcis, and about the middle of the sole of the foot divides into four tendons which pass through the slips of the perforans to be inserted into the extremity of the last joint of the four lesser toes Just before the division of the tendon, it receives a considerable tendon from that of the flexor pollicis longus The use of the perforans is to bend the last joint of the toes

**Flexor digitorum accessorius**—**Massa carnea Jacobi Sylvi**—A small fleshy mass connected with the former, whose office it assists Arises from the lower part of the os calcis, and is inserted into the flexor longus digitorum pedis at its division into four tendons

**Flexor longus pollicis pedis**—A flexor of the great toe, arising fleshy from the upper part of the fibula, and continued down the same bone almost to the ankle by a double order of oblique fleshy fibres Its tendon passes under the annular ligament to be inserted into the last joint of the great toe

## Muscles chiefly situated on the Foot

**Extensor brevis digitorum pedis**—**Extensor brevis**—A common extensor of the toes, very closely connected with the extensor longus digitorum pedis Arises fleshy and tendinous from the fore part of the os calcis, and, passing forwards soon divides into distinct muscular heads, from each of which a tendon is sent off to be inserted into the great toe, and the three next to it, with the extensor longus

**Flexor brevis digitorum pedis**—**Perforatus Sublimis**—Placed on the sole of the foot arises from the inferior and posterior part of the os calcis, soon becomes a fleshy belly, and divides into four tendons, which are split about the root of the first bone of the toes for the passage of the tendons of the flexor longus digitorum pedis Its tendons are inserted into the second phalanx of the four lesser toes, which they bend

**Lumbicales pedis**—These four small muscles resemble the earth-worm, or lumbricus. Arise from the forks of the tendons of the flexor profundus, and pass on to be inserted by slender tendons into the inside of the first joint of the four lesser toes Use, to bend the first joint of the toes, and to draw them towards the great toe

**Flexor brevis pollicis pedis**—Arises by a long tendon from the under and fore part of the os calcis

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is and from the os cuneiform externum, divides into two heads, one of which goes to the abductor, and the other to the adductor pollicis, and is inserted with the tendons of those muscles into the external scaphoid bone and root of the first joint of the great toe, which it bends.

**Abductor pollicis pedis—Thenar—**Arises by short tendinous fibres from the inner and lower part of the os calcis, and is inserted tendinous into the internal scaphoid bone and root of the first joint of the great toe. Use, to pull the great toe from the rest.

**Adductor pollicis pedis—Antithenar—**Arises by a long delicate tendon from the ligament extending from the os calcis to the os cuboides, soon divides into two fleshy heads, which again unite and so obliquely inwards to be inserted into the scaphoid bone, or first bone of the great toe. Use, to bring this toe nearer to the rest.

**Abductor minimi digiti pedis—**Arises from the tuberosity of the os calcis, forms two small tendons, the shorter one inserted into the root of the metatarsal bone of the little toe, and the longer goes on to be fixed into the root of the first bone of that toe. Use, to bend the little toe and carry it somewhat outwards, and to support the tarsus in walking.

**Flexor brevis minimi digiti pedis—Parathenar minor** Arise from the metatarsal bone of the little toe, which it goes over to be inserted into the root of the first bone of the little toe. Use, to bend this toe.

**Transversalis pedis—**Extends transversely across the sole of the foot, arising from the ligament which connects the bones of the tarsus going across to be inserted into the tendon of the adductor pollicis. Contracts the foot.

**Interossei externi et interni—**Four small double-headed muscles situated externally, and four internally, all arising from the metatarsal bones they lie between. Their tendons meet those of the long and short extensors, forming all together the sheath which covers the upper part of the foot.

The muscles situated on the sole of the foot are covered by a strong flat tendon, called the plantar aponeurosis, extended from the os calcis to the first joint of all the toes, protecting the muscles, blood vessels, and nerves running under it.

## ANGIOLOGY, OR DOCTRINE OF THE VESSELS

Vessels are long membranous canals, which carry blood, lymph, chyle, or a secreted fluid, and are hence divisible into arteries, veins, absorbents, and excrements.

### Arterial System

Arteries are elastic membranous canals, which alternately dilate and contract. They progressively grow narrower as they proceed from the heart towards the extremities. They originate from the ventricles of the heart, viz the pulmonary artery from the right, and the aorta from the left ventricle, so that there are only two arteries in strictness of language, the rest being branches of these two. They terminate in veins, or exhalant vessels, or anastomose with one another. They are composed of three membranes, called coats; an external, which is elastic; a middle, which is muscular, and an inner, which is smooth, and serves as a lining to the other two.

The convey blood from the heart to the different parts of the body, for nutrition, preserva-

tion of life, generation of heat and the secretion of different fluids.

The aorta arises from the left ventricle of the heart, forms an arch towards the dorsal vertebrae, then descends through the diaphragm into the abdomen, in which it proceeds by the left side of the spine to the last vertebra of the loins, where it divides into the two iliac arteries. In this course it gives off, just above its origin, two coronary arteries to the heart, and then forms an arch which gives off three other branches which supply the head, neck, and arms with blood, these are,

1 Arteria innominata, which divides into the right carotid and right subclavian arteries.

II The left carotid.

III The left subclavian.

The carotid arteries, having emerged from the chest, run up along the neck, one on each side of the trachea, to the angle of the lower jaw, where they divide into external and internal.

The external carotid gives off eight branches to the neck and face.

1 Arteria thyroidea, which is very tortuous, supplies the thyroid gland and gives off branches to several adjacent muscles.

2 A lingualis, which lies flat upon the side of the tongue, and gives off the ramus hyoidicus, dorsalis linguae, sublingualis, and ramina.

3 A labialis, called also the external maxillary, the angular and facial artery, it gives off the palatina inferior, the submentalis, and the coronary of the lips.

4 A pharyngea inferior, which sends a number of small twigs about the fauces and basis of the cranium.

5 A occipitalis, from which the posterior temporal arises.

6 A posterior auris, which furnishes the parts about the cartilages of the ear with blood and transmits the arteria tympani and stylo mastoidea.

7 A maxillaris interna, which is extremely tortuous, and gives off—the spinous artery to the dura mater, the lower maxillary artery, which is included in the lower jaw and supplies the teeth and face, the pterygoid arteries, which nourish the pterygoid muscles, two deep temporal arteries, which lie within the temporal muscle. The internal maxillary then gives off a branch, which almost immediately divides into the alveolar and infra-orbital, then an artery to the palate, the saphenopalatine, the upper pharyngeal, which plays about the sphenoid sinus, and lastly, the nasal artery, which is transmitted through the sphenopalatine foramen to the cavity of the nostrils.

8 A temporalis, which perforates the parietal gland, and sends off the transversalis faciei, which anastomoses with the arteries of the face, and several branches which go to the ear, forehead, and about the temples.

The internal carotid, or cerebral, leaves the external at the angle of the jaw, and proceeds by the vagus and intercostal nerve to the carotid canal in the petrous portion of the temporal bone, where it is shaped like the letter S, and enters the cranium at the side of the sella turcica, having given off two very small twigs to the pituitary gland, and 3d, 4th, and 5th pair of nerves, and when it has reached the anterior choroid process, it sends off—

1 Arteria ophthalmica, which is distributed to the eye.

2 A anterior cerebri, which proceeds before

3 A posterior cerebri, which proceeds behind

4 A cerebri media, which proceeds between

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the sella tuncica, unites with its fellow, and forms the circle of Willis, from which a branch proceeds to the third ventricle, septum lucidum, and the arteria corporis callosi.

3 A media cerebri, which runs between the anterior and middle lobes of the brain gives off the artery of the choroid plexus, and is lost on the middle lobe of the brain.

4 A communicans which proceeds backwards, and soon anastomoses with the vertebral.

The subclavian artery arises on the right side, from the arteria innominata, and on the left from the arch of the aorta.

Each subclavian gives off five branches.

1 The inferior mammary, from which arise the A. thymica. A. comes plicica, the pericardiac, and the phrenico pericardiac.

2 The inferior thyroid, from which arise the ramus thyroideus, the tracheal arteries, the ascending thyroid, and the transversalis humeri.

3 A vertebralis, which proceeds into the vertebral foramina, to ascend into the cavity of the cranium where it unites upon the cuneiform process of the occipital bone with its fellow of the other side, and forms the basilar artery, which immediately gives off the posterior artery of the cerebellum, it then proceeds upon the tuberculum annulare, to give off four branches, two to the right and two to the left, which constitute the A. anterior cerebelli, which branch to the crura cerebelli, the cerebellum, vermis, crura cerebelli, corpora quadrigemina, pineal gland, and fourth ventricle, and the A. posterior cerebelli which being joined by the communicans supplies the thalami nervorum optico-cerebrum, the centrum geniculum, semicirculare infundibulum, and crura fornicis, and the posterior lobes of the brain, anastomosing with several arteries.

4 A cervicalis profunda.

5 A cervicalis superficialis, both of which are distributed about the muscles of the neck.

6 A intercostalis superior, which lies between the two upper ribs.

7 A supra scapularis, which sometimes arises from the A. thyroidea, when it is called the transversalis humeri.

As soon as the subclavian has arrived in the axilla, it is called the axillary artery, and this again, when it runs into the arm, is termed the brachial.

The axillary artery gives off—

1 The four primary arteries, called thoracica superior, thoracica longior, thoracica humeralis, and thoracica alaris or axillaris, which supply blood to the muscles about the breast.

2 The subscapularis, which supplies the lower surface of the scapula.

3 The circumflexa posterior.

4 Circumflexa anterior, which ramify about the joint.

The brachial or humeral artery gives off—

1 Many lateral vessels.

2 A profunda humeri superior.

3 A profunda humeri inferior.

4 Ramus anastomoticus magnus, which anastomoses round the elbow joint.

The brachial artery then becomes the ulnar, and gives off the radial.

The ulnar or cubital artery sends off—

1 The recurrent branches, which anastomose with the ramus anastomoticus magnus.

2 A interossea communis. It then sends small branches to the adjacent muscles, as it pro-

ceeds down to the wrist, just before it arrives here, it gives off A. dorsalis ulnaris, which goes round to the back of the little finger. At the wrist it gives off A. palmaris profunda, then forms a great arterial arch, called the superficial palmar arch, which supplies branches to the fingers.

The radial gives off the radial recurrent, proceeds to the wrist, where the pulse is felt, and gives off the superficialis volæ, and afterwards divides into the A. dorsalis pollicis A. radialis indicis, A. magna pollicis, and A. palmaris profunda.

The descending aorta gives off, in the breast—

1 The bronchial arteries, which nourish the lungs.

2 The œsophagica, which go to the œsophagus.

3 The intercostal, between the ribs.

4 The inferior diaphragmatic.

Within the abdomen it gives eight branches—

1 The cœlica, which divides into three branches.

a. A. hepatica, which gives off—

a. A. duodeno-gastrica, which ends off the right gastro-epiploic and the pancreatico duodenalis. The latter transmits the plicica inferior and the transverse pancreatic.

b. A. plicica superior hepatica.

The hepatic artery then ramifies through the liver.

ii. A. coronaria ventriculi or gastrica, which gives off the superior coronary and superior plicica arteries.

iii. A. splenica, from which arise the pancreatic magna and pancreatic parva, the posterior gastric arteries, the left gastro-epiploic artery, and the vasa brevia.

2 The superior mesenteric, or mesenteric, of which the colica media colica dextra and the ileo colica are branches.

3 The renal arteries, or œmulgentes, which are short, and divide into three or four branches in the pelvis of the kidney.

4 The spermatic arteries, which are very small and long, and proceed with the spermatic cord to the testicles.

5 The inferior mesenteric, from which arises the left colic artery and the internal hemorrhoidal.

6 The lumbar arteries, which nourish the muscles and vertebrae of the loins.

7 The middle sacral artery, which is distributed about the sacrum.

The aorta then bifurcates, and becomes the iliac arteries.

The iliac soon divides into internal and external.

Each internal iliac, or hypogastric artery gives off five branches.

1 The lateral sacral arteries, three or four in number.

2 The gluteal, which ramify upon the back of the iliac portion of the os innominatum, and supply the gluteal muscles.

3 The ischiatic, which turns downwards along the hip, and gives off the coccygeal artery.

4 Arteria pudica communis, which is sometimes a branch of the sciatic artery, it proceeds out of the pelvis, through the sciatic notch, returns into the pelvis, and runs towards the symphysis of the pubes. In this course it gives off branches to the vesiculæ seminales and prostate gland, and the lower or external hemorrhoidal artery to the anus, and then forms the arteria

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penetrate the anterior penis, which proceed one on each side, and a branch which plunges deep into the substance of the penis.

5 The obturator, which passes through the oval foramen and is distributed through the thick muscles in the centre of the thigh.

Each external iliac gives off—

1 The epigastric, which is reflected from Poupart's ligament upwards along the abdomen.

2 Arteria circumflexa ilia, which run backwards along the crista ili.

The external iliac then passes under Poupart's ligament, become the femoral or crural artery and is continued along the thigh into the popliteal. In this course it gives off, near the groin—

1 The profunda femoris, which gives off the anterior perforans p. a., the art. perforans secunda magna, the art. perforans tertia, the art. perforans quarta, which nourish the muscles of the thigh. The femoral artery then makes a spiral turn round the os femoris and sends off small branches of no importance to adjacent muscles. About two hands' breadth from the knee it gives out—

2 The ramus anastomoticus magnus, which ramifies about the knee joint.

The femoral artery, having reached the ham, is called the popliteal, which gives off several small branches about the joint, and divides below the ham into the tibialis antica and tibialis postica.

The tibialis antica soon perforates the interosseous ligament, passes along the tibia over the bones of the tarsus, and then anastomoses with the back arteries. In this course it gives off—

1 The recurrent, which anastomoses with the anterior branches of the popliteal, it then sends off small branches to neighbouring muscles as it passes down the leg.

2 Arteria malleolaris interna, about the inner ankle.

3 Arteria malleolaris externa, about the outer ankle.

4 Arteria tarsea, which lies upon the bones of the tarsus.

5 Arteria metatarsa, to the tendons of the peronei muscles.

6 Dorsalis externa hallucis, which runs along the metatarsal bone of the great toe.

The tibialis postica passes along the back part of the tibia, goes round the inner ankle, and divides at the heel into the two plantar arteries. In this course it sends off—

1 Arteria nutritia tibiae, which gives branches to the popliteus, soleus, and tibialis anticus muscles, before it enters the bone.

2 Many small branches, as it passes downwards.

3 Arteria plantaris interna, which runs along the inner edge of the sole of the foot, and sends off four branches about the foot.

4 Arteria plantaris externa, which forms an arch and anastomoses with the anterior tibial artery, and gives off the digital branches to the toes.

The pulmonary artery arises from the right ventricle of the heart, and conveys the dark coloured blood into the lungs, which is returned to the heart, of a florid colour, by the veins. It soon divides into a right and left, the right going to the right lung, and the left to the left lung, which each divides into innumerable ramifications, and forms a beautiful network of vessels of vessels, upon the air-vessels, and then terminates in the pulmonary veins, which convey the blood, now become florid, to the left side of the heart.

## Venous System

Veins are membranous canals which do not pulsate, and of the course of whose action we are ignorant. They gradually become larger as they advance towards the heart, in which they terminate, and bring back the blood from the arteries. They originate from the extremities of all the arteries that do not terminate with exhalant orifices.

They progressively anastomose in their course towards the heart, and at length terminate in its auricles.

They run by the sides of arteries, but more superficially, and are divided into branchlets, branches, and trunks.

Like arteries, they are composed of three membranes, but they are semi-transparent, and more delicate.

They are armed with valves, which are thin semilunar membranous folds, found in most veins, and placed there to prevent the blood from being pressed backwards out of its natural course.

The blood is returned from every part of the body into the right auricle—the vena cava superior receives it from the head, neck, thorax, and superior extremities, the vena cava inferior, from the abdomen and inferior extremities, and the coronary vein receives it from the coronary arteries of the heart.

The vena cava superior terminates in the superior part of the right auricle, into which it evacuates the blood from the right and left subclavian veins, and the vena axillares.

The right and left subclavian veins receive the blood from the head and upper extremities, in the following manner.

The veins of the fingers, called digitals, receive their blood from the digital arteries, and empty it into—

1 The cephalic of the thumb, which runs on the back of the hand along the thumb, and evacuates itself into the external radial.

2 The basilicella, which runs along the little finger, unites with the former, and empties its blood into the internal and external cubital veins. At the bend of the fore-arm are three veins, called the great cephalic, the basilic, and the median.

The great cephalic runs along the superior part of the fore-arm, and receives the blood from the external radial.

The basilic ascends on the under side, and receives the blood from the external and internal cubital veins, and some branches which accompany the brachial artery, called vena satellitum.

The median is situated in the middle of the fore-arm, and arises from the union of several branches.

These three veins all unite above the bend of the arm, and form—

The brachial vein, which receives all their blood, and is continued into the axilla, where it is called

The axillary vein. This receives also the blood from the scapula, and superior and inferior parts of the chest, by the superior and inferior thoracic vein, the vena muscularis, and the scapularis.

The axillary vein then passes under the clavicle, where it is called the subclavian, which unites with the external and internal jugular veins, and the vertebral vein which brings the blood from the vertebral arteries; it receives also the blood from the mediastinal, pericardiac, diaphragmatic, thyroidei, internal mammary, and is-

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ryngeal veins, and then unites with its fellow, to form the *vena cava superior*, or, as it is sometimes called, *vena cava ascendens*.

The blood from the external and internal parts of the head and face is returned in the following manner into the external and internal jugulars, which terminate in the subclavians.

The frontal, angular, temporal, auricular, sublingual, and occipital veins receive the blood from the parts after which they are named, these all converge to each side of the neck, and form a trunk called the external jugular vein.

The blood from the brain, cerebellum, medulla oblongata, and membranes of these parts, is received into the lateral sinuses, or veins of the dura mater, one of which empties its blood through the foramen lacerum in basi crani into the internal jugular, which descends in the neck by the carotid arteries, receives the blood from the thyroid and internal maxillary veins, and empties itself into the subclavians within the thorax.

The *vena azygos* receives the blood from the bronchial, superior oesophageal, vertebral, and intercostal veins, and empties it into the superior cava.

The *vena cava inferior* is the trunk of all the abdominal veins, and those of the lower extremities, from which parts the blood is returned in the following manner.

The veins of the toes, called the digital veins, receive the blood from the digital arteries, and form on the back of the foot three branches: one on the great toe called the cephalic, another, which runs along the little toe, called the *vena saphena*, and one on the back of the foot, *vena dorsalis pedis*, and on the sole of the foot they evacuate themselves into the plantar veins.

The three veins in the upper part of the foot coming together above the ankle, form the anterior tibial, and the plantar veins, with a branch from the calf of the leg, called the sural vein, form the posterior tibial. A branch also ascends in the direction of the fibula, called the peroneal vein. These three branches unite before the ham, into one branch, the subpopliteal vein, which ascends through the ham, carrying all the blood from the foot, it then proceeds upon the anterior part of the thigh where it is termed the crural or femoral vein, receives several muscular branches, and passes under Poupert's ligament into the cavity of the pelvis, where it is called the external iliac.

The arteries which are distributed about the pelvis evacuate their blood into the external hæmorrhoidal veins, the hypogastric veins, the internal pudendal, the *vena magna penis*, and obturator veins, all of which unite in the pelvis, and form the internal iliac vein.

The external iliac vein receives the blood from the external pudendal veins, and then unites with the internal iliac at the last vertebra of the lumbæ, and forms the *vena cava inferior*, or ascendens, which ascends on the right side of the spine, receiving the blood from the sacral, lumbar, right spermatic veins, and the *vena cava hepatica*, and, having arrived at the diaphragm passes through the right foramen, and enters the right auricle of the heart, into which it evacuates all the blood from the abdominal viscera and lower extremities.

The *venæ cavae hepaticæ* ramify in the substance of the liver, and bring the blood into the *vena cava inferior* from the branches of the *vena portæ*.

The *vena portæ* carries the blood from the abdominal viscera into the substance of the liver. The trunk of this vein, about the fissure of the liver, in which it is situated, is divided into the hepatic and abdominal portions. The abdominal portion is composed of the splenic, mesenic, and internal hæmorrhoidal veins. These three venous branches carry all the blood from the stomach, spleen, pancreas, omentum, mesentery, gall-bladder, and the small and large intestines into the sinus of the *vena portæ*. The hepatic portion of the *vena portæ* enters the substance of the liver, divides into innumerable ramifications, which secrete the bile, and the superfluous blood passes into corresponding branches of the *vena cava hepatica*.

## Absorbent System

Absorbents are very thin and pellucid vessels, which imbibe and carry the lymph from every part of the body, as they do also substances applied to the surface of the body, and the chyle from the intestines, into the thoracic duct. They are divided into lacteals and lymphatics. They are called lacteals in the intestines and mesentery, and lymphatics in every other part. Like the veins, they anastomose and become broader as they proceed towards their termination. Their valves are more numerous, and give them a knotted appearance. They are supposed to exist in every part of the body, although they have not been as yet detected in some, as the brain, &c. They originate from the cellular membrane of the viscera, the excretory ducts of the viscera, the external surface, and every part of the body, and terminate in the thoracic duct or subclavian vein. They become frequently imbricated, and form lymphatic or conglobate glands which are situated every where in the course of the lymphatics. Their structure consists of tender, pellucid, strong tunics. The use of the absorbents is to carry back the lymph from different parts into the blood, to convey the chyle from the intestines to the thoracic duct, where it is mixed and diluted by the lymph, and to absorb substances from surfaces and parts on which they originate. We are as ignorant of the cause of the propulsive power of the absorbents as we are of that of the veins.

The lacteal absorbents, forming a part of the mesentery, are considered in the division of Splanchnology.

The lymphatic absorbents exist in every the minutest part of our body. This is proved by experiment, though their existence cannot be demonstrated to the eye. They are divided into those of the head and neck, upper and lower extremities, and those of the viscera.

*Lymphatics of the head and neck*.—The absorbents on the scalp and about the viscera of the neck, unite into a considerable branch that accompanies the jugular vein. Absorbents have not been detected in the human brain, yet there can be no doubt of there being such vessels. It is probable that they pass out of the cranium through the canalis caroticus and foramen lacerum in basi crani, on each side, and join the above jugular branch, which passes through some glands as it proceeds into the chest to the angle of the subclavian and jugular vein.

The absorbents of the upper extremities are divided into superficial and deep-seated. The superficial ascend under the skin in every direction.

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tion to the wrist, whence a branch proceeds upon the posterior surface of the fore arm to the head of the radius, over the internal condyle of the humerus, up to the axilla receiving several branches in its course. Another branch proceeds from the wrist along the anterior part of the fore arm and forms a network with a branch coming over the ulna from the posterior part, and ascends on the inside of the humerus to the glands of the axilla.

The deep seated absorbents accompany the larger blood vessels and pass through two glands about the middle of the humerus, and ascend to the glands of the axilla. The superficial and deep seated absorbents having passed through the axillary glands, form two trunks, which unite into one to be inserted with the jugular absorbents into the thoracic duct at the angle formed by the union of the subclavian with the jugular veins.

The absorbents of the inferior extremities are also superficial and deep seated. The superficial lie between the skin and muscles. Those of the toes and foot form a branch which ascends upon the back of the foot over the tendon of the cruræus inticus, forms with other branches, a plexus above the ankle, then proceeds along the tibia over the tibia, sometimes passes through a gland, and ascends the inside of the thigh to the subinguinal glands.

The deep seated absorbents follow the course of the arteries and accompany the femoral artery, in which course they pass through some glands in the leg and above the knee, and then proceed to some deep seated subinguinal glands.

The absorbents from about the external parts of the penis, perineum, and from the external part of the pelvis in general proceed to the anal glands. The subinguinal and inguinal glands send both several branches, which pass through the abdominal ring into the cavity of the abdomen.

The absorbents of the lower extremities accompany the external iliac artery, where they are formed by many branches from the uterus, urinary bladder, spermatic cord, and some branches accompany the internal iliac artery. They then ascend to the sacrum where they form a plexus, which proceeds over the psoas muscles, and meet with the lacteals of the mesenteries form the mesentericum cili which in infants, is about the size of a hare's pen and is the commencement of the thoracic duct or trunk of the absorbents which is formed by the junction of the lymphatics of the lower extremities and the lacteals, it is of a serpentine figure, about the size of a crow-quill, and runs up the dorsal vertebrae through the posterior opening of the diaphragm between the aorta and vena cava, to the angle formed by the union of the subclavian and jugular veins. In this course it receives—

1 The absorbents of the kidneys which are both superficial and deep seated, and unite as they proceed towards the thoracic duct.

2 The absorbents of the spleen, which are upon its peritoneal coat, and unite with those of the pancreas.

3 A branch from a plexus of vessels passing above and below the duodenum, and formed by the absorbents of the stomach, which come from the lesser and greater curvature, and are united about the pylorus with those of the pancreas and liver, which converge from the external surface

and internal parts towards the porta of the liver, and also by several branches from the gall-bladder.

4 The absorbents of the diaphragm, pleura, lungs, heart, and pericardium.

## Secreting System

The capillary arteries which do not terminate in veins secrete, either by their own mouths, or certain peculiar fluids, fitted to the organs to which they respectively appertain, or give birth to other vessels, which secrete them in their stead, but the minuteness of these capillary tubules prevents all decision upon this subject.

It is from these secreting vessels that the surface of every membrane and cavity of the body, whether external or internal, is sufficiently lubricated to fulfil its respective function.

The fluids which are thus discharged are of various kinds, mucous, seraceous, or limpid, adapted to the uses of the organs to which they appertain. They are also secreted in various quantities and quantities sometimes by the medium of glands, sometimes without any such organization and into distinct bags or pouches called bursæ. Whence the more important of the secretory organs may be divided into bursal and glandular.

*Bursæ* or *bursæ mucosæ* possessing this epithet from the peculiar nature of their content are composed of a proper membrane, containing a kind of mucous fat, formed by the exhalant arteries of their internal surface. They are of different sizes and firmness and connected to each other by cellular membrane with the capsular ligaments of cavities, tendon, bones or ligaments. Their internal surface is highly vascular, smooth and shining. They are divided into vascular and avascular, and their office is to lubricate the muscles and tendons which are very frequently in motion. They are variously situated. The following are the chief.

I About the head. 1 Bursa of the superior oblique muscle of the eye, situated behind its trochlea in the orbit.—2 Bursa of the diaphragm, in the internal surface of its tendon.—3 Bursa of the circumflexus or tensor palati between the hook-like process of the sphenoid bone and the tendon of that muscle.—4 Bursa of the sterno-hyoid muscle, between the os hyoides and larynx.

II About the shoulder joint. 1 External acromial under the acromion, between the coracoid process, deltoid muscle, and capsular ligament.—2 Internal acromial, above the tendon of the infraspinatus and teres major often communicating with the former.—3 Coracoïd bursa near the root of the coracoïd process—it is sometimes double, and sometimes triple.—4 Clavicular bursa found where the clavicle touches the coracoid process.—5 Subclavian bursa, between the tendon of the subclaviarius muscle and the first rib.—6 Coraco brachial, between the common origin of the muscle the biceps, and the capsular ligament.—7 Bursa of the pectoralis major, under the head of the humerus, between the internal surface of the tendon of that muscle, and another bursa placed on the long head of the biceps.—8 External bursa of the teres major, under the head of the os humeri, between it and the tendon of the teres major.—9 Internal bursa of the teres major, found within the muscle where the fibres of its tendon diverge.—10 Bursa of the latissimus dorsi, between the tendon of this muscle and the os humeri.—11 Humero-bicipital bursa, in the vagina of the

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tendon of the biceps. There are other bursæ mucosæ about the humerus, but their situation is uncertain.

III Near the elbow joint — 1 Radio-bicipital, between the tendon of the biceps brachialis, and anterior tubercle of the radius — 2 Cubito-radial, between the tendon of the biceps, supinator brevis, and the ligament common to the radius and ulna — 3 Anconæal bursa, between the olecranon and tendon of the anconeus muscle — 4 Capitulum radial bursa, between the tendon common to the extensor carpi radialis brevis, and extensor communis digitorum and round head of the radius. There are other bursæ, but as their situation varies they are omitted.

IV Of the inferior part of the fore-arm and hand. On the inside of the wrist and hand — 1 Very large bursa, for the tendon of the flexor pollicis longus — 2 Four short bursæ on the fore part of the tendons of the flexor sublimis — 3 Large bursa behind the tendon of the flexor pollicis longus, between it and the fore part of the radius, capsular ligament of the wrist, and os trapezium — 4 Large bursa behind the tendons of the flexor digitorum profundus, and on the fore part of the end of the radius and fore part of the capsular ligament of the wrist. In some subjects it communicates with the former — 5 Oblong bursa, between the tendon of the flexor carpi radialis and os trapezium — 6 Very small bursa between the tendon of the flexor carpi ulnaris and os pisiforme.

On the back part of the hand and wrist — 7 Bursa between the tendon of the abductor pollicis longus and the radius — 8 Large bursa between the two extensores carpi radiales — 9 Another below it, common to the extensores carpi radiales — 10 Bursa at the insertion of the tendon of the extensor carpi radialis — 11 Oblong bursa for the tendon of the extensor pollicis longus, and which communicates with 9 — 12 Bursa for the tendon of the extensor pollicis longus, between it and the metacarpal bone of the thumb — 13 Bursa between the tendons of the extensor of the foot, middle and ring fingers — 14 Bursa for the extensors of the little finger — 15 Bursa between the tendon of the extensor carpi ulnaris and ligament of the wrist. There are also but a mucosæ between the musculi lumbriculi and interossei.

V Near the hip joint. On the fore part of the joint — 1 Ileo pubic, between the iliacus internus, psoas major, and the capsular ligament of the head of the femur — 2 Pectineal, between the tendon of the pectineus and the thigh bone — 3 Small bursa of the gluteus medius muscle, situated between it and the great trochanter, before the insertion of the pyramidalis — 4 Bursa of the gluteus minimus muscle, between its tendon and the great trochanter — 5 Intero-fascial, between the gluteus maximus and vastus externus.

On the posterior part of the hip joint — 6 Tubero ischiatic bursa, between the obturator internus muscle, the posterior spine of the ischium, and its tuberosity — 7 Obturator bursa, which is oblong and found between the obturator internus and gemini muscles and the capsular ligament — 8 Bursa of the semi-membranosus under its origin and the long head of the biceps femoris — 9 Gluteo trochanteral bursa, between the tendon of the psoas muscle and the root of the great trochanter — 10 Two gluteo femoral bursæ between the tendon of the gluteus maximus and os

femoris — 11 Bursa of the quadratus femoris between it and the little trochanter — 12 Iliac bursa, between the tendon of the iliacus internus and the little trochanter.

VI Near the knee joint — 1 Suprapatellar, which adheres to the tendons of the vasti and cruralis and the fore part of the tibia bone — 2 Infra genual bursa, under the ligament of the patella, and often communicates with the above — 3 Anterior genual, placed between the tendon of the sartorius, gracilis, and semi tendinosus, and internal and lateral ligament of the knee — 4 Posterior genual, which is sometimes double and situated between the tendons of the semi-membranosus, the internal head of the gastrocnemius, the capsular ligament, and internal condyle — 5 Popliteal, conspicuous between the tendon of that muscle, the external condyle of the femur, the semilunar cartilage, and external condyle of the tibia — 6 Bursa of the biceps cruris between the external part of the tendon of the biceps cruris, and the external lateral ligament of the knee.

VII In the foot. On the back, side, and hind part of the foot — 1 Bursa of the tibialis anticus, between its tendon, the lower part of the tibia and capsular ligament of the ankle — 2 Bursa between the tendon of the extensor solis pedis longus, the tibia and capsular ligament of the ankle — 3 Bursa of the extensor digitorum communis between its tendons, the tibia, and ligament of the ankle — 4 Large bursa, common to the tendons of the peronei muscles — 5 Bursa of the peroneus brevis, proper to its tendon — 6 Calcaneal bursa, between the tendo Achillis and os calcis.

In the sole of the foot — 1 Bursa for the tendon of the peroneus longus — 2 Bursa common to the tendon of the flexor pollicis pedis longus, and the tendon of the flexor digitorum communis profundus — 3 Bursa of the tibialis posterior, between its tendon, the tibia, and the calcaneus — 4 Five bursæ for the flexor tendon which begin a little above the first joint of each toe and extend to the root of the third phalanx or in insertion of the tendons.

## Glands

These are small, round, vascular bodies which serve for the secretion or alteration of a fluid. They are hence either secretory or lymphatic. The former only belong to the present chapter, which differs from the latter by the possession of an excretory duct for the discharge of the fluid secreted. They are divisible into folliculose, glomerate, and conglomerate, they are also divided from the liquid they secrete or change, into sebaceous, muciparous, lymphatic, lachrymal, salival, bilious, lacteal &c.

A follicle, or folliculose gland, consists of a hollow vascular membrane having an excretory duct, is the muciparous and sebaceous glands.

A glomerate gland is formed of a glomer of sanguiferous vessels, has no cavity, but is furnished with an excretory duct, as the lachrymal and mammary glands.

A conglomerate gland is composed of many glomerate glands, whose excretory ducts unite, and form one large canal or duct, as the salivary and sweat glands belong to this class. They do many other offices in the economy of the body, under the division of glands.

The excretory duct of the



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which goes out of the gland and externs the secreted fluids by the contractility of its cutis. The nerves and vessels of gland are numerous, and, in most instances, come from the neighbouring parts. Some particular glands are, however, supplied with vessels proper to them, as the vascular gland, the thyroid, pituitary &c. Glands are connected with other parts by cellular membrane. They are larger in infants than in adults, and may be thus subdivided.

1 Subcutaneous glands sebaceous, and situated under the skin which they perforate by their excretory ducts.

2 The glands of the dura mater, called also, after their discoverer Piccionini, small fatty substance, situated near the superior longitudinal sinus of the dura mater in peculiar foveolar of the skull and piala glands.

3 The mammary gland, situated in a duplication of the cutis under the scuturum of the scapula bone. The umbiliculus of the brain terminates in the gland.

4 Mucous glands, small and numerous. 5 Ocular glands, situated under the skin of the eyelids, near their origin. Their excretory ducts open on the margins of the tarsus, and are called puncta carnea.

6 Lacrymal gland, situated above the external angle of the orbit in a peculiar depression of the orbit. It is six or eight excretory canals, through which the tears are conveyed, and which open upon the internal surface of the upper eyelids.

7 Ceratopharyngeal, a small and red prominent body on the internal angle of the eye, a sebaceous gland, which secrete a feculent humour.

8 The internal membrane lining the nostrils and sinuses is every where furnished with numerous glands, which secrete the mucus of the nose.

9 The ceruminous glands under the skin of the meatus auditorius externus, secrete the wax of the ears.

10 The glands of the mouth, which secrete the saliva, called salivary they are,

a Parotids. Two large conglomerate glands, situated one under each ear, between the malar process of the temporal bone and angle of the lower jaw. The excretory canal of this gland opens in the mouth and is called, from its discovery the Stenonian duct.

b Mucillary. Which are conglomerate glands situated under the angles of the lower jaw. The excretory ducts of these glands are also called, after their discoverer, Whartonian.

c Sublingual, situated under the tongue.

d Glands of the cheek, situated on the internal surface of the cheeks.

e Labial glands; on the internal surface of the lips, under the common membrane of the mouth.

f Molar glands; on each side of the mouth between the masseter and buccinator muscles. Their excretory ducts open near the last den molaris.

10 External glands of the neck as follow — Jugular glands, found under the skin of the neck about the external jugular veins they are in general about twenty in number.

Submaxillary glands, and situated in the fat under the jaw.

Cervical, found under the cutis in the fat about the neck.

Thyroid. A large gland lying upon the tracheal cartilage trachea, and horns of the thyroid cartilage. It is uncertain whether it be globate or conglomerate. Its excretory duct has never been detected and its use is unknown.

11 Glands of the fauces, situated under the membrane which lines this cavity, muciparous, and divided, from their situation into palatine, uvular, tonsil, lingual, laryngeal, and pharyngeal.

12 The mammary, or lacteal gland, situated under the fat of the breasts. Their excretory ducts are called tubuli lactiferi and tubuli galactiferi, they proceed to the nipple, in which they open.

13 Glands of the thorax, as follow — The thymus, large and peculiar to the fetus, and which disappears soon after birth, situated in the anterior duplicature or space of the mediastinum, under the superior part of the sternum, and above the pericardium. An excretory duct has not been as yet detected, but lymphatics are seen going from this gland to the thoracic duct.

a Bronchial, large blackish glands near the end of the trachea, and beginning of the bronchia, and which secrete a blackish mucus.

b Oesophageal, under the internal membrane of the oesophagus secrete the mucus of that canal.

c Dorsal, upon the fourth or fifth vertebra of the back, between them and the posterior surface of the oesophagus. No excretory duct has been hitherto traced.

14 Glands of the abdomen as follow — celiac, muciparous, and situated under the external membrane of the stomach.

In this also mucous and fat the internal membrane of the intestine appears, the lacteal.

7 Mesenteric in the cellular membrane of the mesentery. The excretory ducts of the intestine pass through these glands to the lacteal duct.

Hepatic, called aciniform and penicillate, which form the lobes of the liver, and secrete the bile into small ducts which terminate in the duct hepaticus. See Liver.

8 Cystic, muciparous, found under the external membrane of the gall bladder, especially about its neck.

9 Pancreatic, which constitute the pancreas, a small duct arise from each gland which unite to form the ductus pancreaticus. See *Sp. natur.*

10 Epiploic or omentum, globate, and situated in the omentum.

11 Glands of the loins as follow — Suprarenal, in the adipose membrane, one above each kidney. An excretory duct has never been detected and their use is unknown.

6 Kidneys. See *Splanchnology*.

7 Lumbar, globate and situated about the beginning of the thoracic duct.

8 Ilac, found about the beginning of the iliac vessels.

9 Serrati, globular glands, and adhere to the os sacrum.

16 Glands of the organ of generation of man as follow — a Odontogenic of the gum penis, sebaceous, and situated around the orifices of the urethra.

b Mucous of the urethra, under the internal membrane of the urethra. The mouths of their excretory ducts are called Licuæ.

c Cowpers, so called from their discoverer three large muciparous glands, two of which are situated before the prostate gland under the ac

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erectores urethrae and the third more forward before the bulb of the urethra

16 Prostate, a very large heart like, firm gland, situated between the neck of the urinary bladder and bulbous part of the urethra. Secrete a lactid fluid, which is emitted into the urethra by ten or twelve ducts near the verumontanum, during coition

17 Gland of the female organs of generation as follow — Olfiferous of the labia majora and nymphæ, sebaceous, and situated under the skin of those parts

18 Olfiferous of the clitoris numerous, situated about the basis of the clitoris, and of the same nature as the former

19 Mucous of the urethra, under the internal membrane of the urethra

20 Mucous of the vagina, under the internal membrane of the vagina

18 Glands of the extremities as follow — Of the groin, or inguinal, globate, or lymphatic, situated in great numbers in the cellular membrane of the inguinal region and receive the lymphatic vessels from the glans penis and lower extremities

Submammary also globate and situated in the cellular membrane of the arm-pit, numerous and receive the lymphatic vessels from the breasts and superficial extremities

19 Glands of the joints are the small fatty like mucus situated within the movable joints, and are composed of a fluid synovial their structure is so spongy they are composed of alveoli and are arranged in the interstices of the membrane of the joint, which gives them a lubricated appearance. These little masses the synovia is separated from the blood for the easy motion of the joint

## NEUROLOGY, OR DOCTRINE OF THE NERVE

Nerves are long whitish pulpy tubes composed of a bundle of fibres of various size which give for sensation. They originate from the cerebrum, cerebellum, medulla oblongata, and medulla spinalis. Those which arise from the cerebrum, cerebellum, and medulla oblongata, are called cerebral nerves, and those from the medulla spinalis, spinal nerves. All the other nerves of the body arise from these two sources

They terminate in the organs of sense, viscera, muscles, bones, &c. And are divided into trunks, branches, capillary tubules, papillæ, nervous plexuses, and ganglions, or knots

The nerves consist of thirty-nine pairs, — nine of cerebral and thirty of spinal. The nine pairs of cerebral nerves are, 1 The olfactory 2 The optic 3 Oculum motorium 4 The pathetic, or trochlear 5 The trigemini or division 6 The abducent 7 The auditory and facial 8 The par vagum, or great sympathetic nerves 9 The lumbar pair

The thirty pairs of spinal nerves are divided into eight of cervical, twelve of dorsal, five of lumbar and five of sacral nerves

All the cerebral and spinal nerves are covered at their origin by the pia mater, and at their exit from the skull and spine by the dura mater, which latter constitutes the vagina of the nerve, in the form of a firm cellular texture, but when the nerve arrives at its place of destination, it appears in a soft pulpy state

The ganglions, or knots of nerves are whitish red bodies, of various size and figure, and are harder than a nerve found in the course of many of the nerves. They consist of medullary and fibrous substance, their use is not known

When nerves are woven together in a mass they form a plexus, these are common about the abdominal viscera

Nerves are the source of sensation and touch constitute the organs of the five external senses — touch sight hearing smelling, and taste they also give motivity to the muscles

## Tenour of the nerves

proceed immediately from the brain and are in pairs that is one from each side of the brain, they are commonly called after their order, 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, 9th, 10th, 11th, 12th. And as they are all subservient to some specific purpose they have the received appropriate appellations, as olfactory, optic, &c.

The first pair, or olfactory nerves, arise from the corpora striata, in a triangular form pass forwards becoming flatter over the parietal and frontal bones, one on each side of the crista galli, where they are flattened and under each send down a number of branches which go through the cribriform foramen of the ethmoid bone, to be distributed on the pituitary body and the nose, on which membrane they form the organ of smelling.

The second pair, or optic nerves arise from the thalami nervorum opticorum turn round the crura cerebri, become thinner, decussate each other, or re-united together to a point beneath the foramina optica, and perforate the bulb of the eye, to form the retina

The third pair, or oculorum motorium arise from the crura cerebri, near the pons Varolii pass forwards towards the top of the petrous portion of the temporal bone, where they perforate the dura mater and proceed to be inserted into the bulb of the eye, where they move the eye some distance from the socket, from thence the nerve joins a branch of the fifth pair in the orbit, and form a ganglion, which is termed the lenticular or ophthalmic ganglion, whence small branches proceed to the choroid membrane of the eye, the iris, uvea, and tunica sclerotica

The fourth pair, or the pathetic nerves arise from the crura of the cerebellum laterally pass forward pierce the dura mater below the third pair, and proceed with them through the orbital foramen to be inserted into the trochlear muscle of the eye

The fifth pair, or trigemini, arise from the anterior part of the crura of the cerebellum and are divided within the cavity of the cranium into three branches, viz the ophthalmic or orbital, and the superior and inferior maxillary

The orbital nerve give off a branch near its origin, which unites with a branch of the sixth pair to form the great trochlear nerve, it then divide into three branches

1 The frontal which goes through the superciliary foramen, the muscles and integuments of the forehead

The lachrymal, which goes to the lachrymal gland

The nasal, which goes forwards to the inner canthus of the eye where it gives off a branch or two, returns into the cranium, and passes through

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the cribriform plate of the ethmoid bone, and is distributed on the pituitary membrane.

The superior maxillary nerve goes through the foramen rotundum and is divided into—

1 The sphenopalatine, which passes through the sphenopalatine foramen, sends twigs to the internal pterygoid muscle, then enters the cavity of the nostrils, and is lost on the Eustachian tube, soft palate, and pituitary sinus of the sphenoid bone.

2 The posterior alveolar branch, which descends through the foramen by the last grinder, and is distributed to the molars.

3 The infra orbital nerve, which goes through the infra orbital foramen, and is distributed on the muscles of the cheek, nose, lips, and communicates with the facial nerve.

The inferior maxillary goes out of the cranium, through the foramen ovale, giving branches to the muscles and glands in its course, and to the facial nerve, and divides as it passes over the pterygoid muscle into—

1 The mental lingual, which is connected with the chorda tympani, and supplies the sublingual glands and contiguous muscles, but more especially the tongue.

2 The more proper inferior maxillary, which goes into the canines mentalis of the lower jaw, gives a branch to each tooth, and comes out again to supply the lower lip and chin.

The sixth pair, or abducent nerves, arise from the posterior part of the pons Varoli, proceed forward, perforate the dura mater, and send off some branches near the sella turcica, which unite with branches of the ophthalmic nerve of the fifth pair, to form the great intercostal nerve, then accompany the third and fourth pair through the orbital fissure, and are distributed on the rectus medialis muscles of the bulb of the eye.

The seventh pair, or auditory nerves, as they are commonly called, originate on each side by two branches, the portio dura and portio mollis.

The portio dura is, in fact, a nerve of the face and is therefore, with more propriety, called the facial nerve. It arises from the fourth ventricle of the brain, passes through the petrous portion of the temporal bone, where it gives off the chorda tympani, proceeds through the stylomastoid foramen, perforates the parotid gland, and then divides into seven or eight branches, which constitute the pes anserinus, supply the ear, parotid gland and muscles of the face, and communicate with the branches of the fifth pair on the face.

The portio mollis, or auditory nerve, arises from the medulla oblongata and the fourth ventricle, enters the internal auditory passage, and is distributed by innumerable branches on the membrane of the cochlea, vestibulum, forming the immediate organ of hearing.

The eighth pair, or par vagum, arise by several branches, partly from the medulla oblongata, partly from the fourth ventricle behind the pons Varoli. Is connected at its origin with the accessory nerves of Willis, which ascend through the great occipital foramen from the sixth cervical nerve, and proceeds conjointly through the foramen verticillatum in the occiput. The accessory nerve then separate from the par vagum, and vanish in the crura clauda mastoideus and cucullaris muscles. The par vagum gives off branches in the neck to the tongue, larynx, and thyroid gland, from which they acquire names, and it

descends into the cavity of the thorax, where it gives off—

1 The right and left recurrent, the former arises on the right side, near the subclavian artery which it surrounds, and then returns upwards to the thyroid gland, the latter arises under the arch of the aorta which it surrounds, and then ascends to the œsophagus. Both nerves are lost in the muscles of the larynx and pharynx.

2 Several branches which proceed to the superior part of the pericardium, to form with other nerves the cardiac plexus, which sends branches to the heart.

3 The par vagum then extends on the posterior surface of the lungs on each side, and gives off some branches, which, with others from the cardiac plexus and recurrent nerves, form a right and left pulmonary plexus, which supplies the lungs and trachea.

4 Both trunks of the par vagum then descend with the œsophagus, and give off many ramifications, which form the œsophageal plexus, from which the œsophagus and adjoining parts are supplied.

5 Having passed the diaphragm with the œsophagus, they form about the cardia, two stomachic plexuses, the anterior is expanded over the anterior surface of the stomach and its great curvature, the posterior over the posterior surface and less curvature, and it transmits also branches to the liver, pancreas, and diaphragm.

6 The par vagum also sends some branches to unite with the great intercostal and thus concurs in forming the hæmic, splenic and renal plexuses.

The ninth, or lingual pair of nerves, arise from the medulla oblongata between the corpora olivaria and pyramidalis pass out of the skull through the foramina condyloidea anteriora, and communicate with the par vagum and first pair of cervical nerves, proceed forwards between the jugular vein and carotid artery and are distributed on the muscles of the tongue and os hyoides.

Thus it appears that the olivary and ethanmic nerves, and the oculum motorium, arise from the cerebrum, the trochlearis and trigeminus from the cerebellum, and the auditory par vagum, and linguals, from the medulla oblongata.

## Of the Nerves of the Medulla Spinalis,

called also spinal nerves, pass out through the lateral or intervertebral foramina of the spine.

Each nerve arises by two twigs, which unite and form a small ganglion before the nerve leaves the vertebral canal. They receive a covering from the dura and pia mater, which accompanies them to their ultimate terminations.

The spinal nerves are divided into cervical, dorsal, lumbi, and sacral.

The cervical nerves are eight pairs, and are to be distinguished from the nerves which pass from the brain along the neck.

The first or occipital, arise from the beginning of the spinal marrow, pass out between the margins of the occipital foramen transversarium, form a ganglion on its transverse process, and are distributed about the occiput and neck.

The second pair send a branch to the accessory nerve of Willis, and proceed to the parotid gland and external ear.

The third supply the intercostals of the scapula, cucullaris, and triangulus muscles, and send a branch to assist in forming the diaphragmatic nerve.

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† The fourth sends off two branches, one to unite with branches from the second and fifth cervical pairs, which union forms the accessory nerve of Willis, the other to unite with a branch from the third and fifth cervical, which forms the diaphragmatic nerve.

The fourth, fifth, sixth, seventh, and eighth pairs converge to form the brachial plexus, from which arise the accessory nerves of Willis, the diaphragmatic nerve, and the nerves of the upper extremities, which therefore belong to this section.

## *The accessory nerve of Willis*

arises on both sides of the neck from the union of branches from the second, fourth, and fifth pairs, proceeds upwards through the great occipital foramen to the medulla oblongata, joins the par vagum, and accompanies it out of the skull, through the foramen lacerum in basilarium, and leaves it to be distributed on the cucullaris and sterno cleido mastoideus muscles.

The diaphragmatic or phrenic nerve is formed in the neck by the union of the branches from the third, fourth, and fifth cervical pairs, and by a branch coming from the first pair of dorsal nerves, and another from the great intercostal passes between the clavicle and subclavian artery into the thorax, and descends along the pericardium to the upper surface of the diaphragm, where it divides into numberless branches, which are lost in its substance.

All the nerves of the upper extremities arise from the brachial plexus situated in the neck, which is chiefly constituted by the union of the five lowermost cervical nerves, and a large branch of the first pair of the back. Several small branches are first given off to contiguous parts, and then—

1 The axillary nerve which sometimes arises from the radial nerve, and innervates the muscles of the scapula.

2 The external cutaneous, which perforates the coraco brachial muscle, to the bend of the arm, where it communicates the median vein as far as the thumb and is lost in its integuments.

3 The internal cutaneous, which descends on the inside of the arm, where it bifurcates. From the bend of the arm, the anterior branch communicates the basilic vein, to be inserted into the skin of the palm of the hand, the posterior branch runs down the internal part of the fore arm, to vanish in the skin of the little finger.

4 The median nerve which accompanies the brachial artery to the cubit then passes between the brachialis internus pronator rotundus, and the perforator and perforans, under the ligament of the wrist to the palm of the hand, where it sends off branches in every direction to the muscles of the hand, and then supplies the digital nerves which go to the extremities of the thumb, fore and middle fingers.

5 The ulnar nerve, which descends between the brachial artery and basilic vein, between the internal condyle of the humerus, and the olecranon and divides in the fore arm into an internal and an external branch. The former passes over the ligament of the wrist and os acromioid bone, to the hand, where it divides into three branches, two of which go to the ring and little finger, while the third forms an arch towards the thumb in the palm of the hand, and is lost in the contiguous muscles. The latter passes over the tendon

of the extensor carpi ulnaris and back of the hand to supply also the two last fingers.

6 The radial nerve which sometimes gives off the axillary nerve. It passes backwards about the os humeri, descends on the outside of the arm, between the brachialis externus and internus muscles to the cubit then proceeds between the supinator longus and brevis to the superior extremity of the radius, giving off various branches to adjacent muscles. It then divides into two branches, one going along the radius between the supinator longus and radialis internus to the back of the hand and terminates in the interosseous muscles, the thumb, and three first fingers the other passing between the supinator brevis and head of the radius, and lost in the muscles of the forearm.

The dorsal nerves are twelve pairs in number. The first pair gives off a branch to the brachial plexus. All the dorsal nerves are distributed to the muscles of the back, intercostals, scapular, pectoral, abdominal muscles and diaphragm. The five inferior pairs go to the cartilage of the ribs, and are called costal.

The five pair of lumbar nerves are bestowed about the loins and its muscles the skin of the abdomen and loins, crorum, ovaria, and diaphragm. The second, third, and fifth pair unite and form the obturator nerve which descends over the psoas muscle into the pelvis and passes through the foramen thyroideum to the obturator muscle triceps pectineus &c.

The third and fourth, with some branches of the second pair, form the crural nerve, which passing under Poupert's ligament with the femoral artery, sends off branches to the adjacent part, and descends in the direction of the sartorius muscle to the internal condyle of the femur whence it accompanies the saphena vein to the internal ankle to be lost in the skin of the great toe.

The fifth pair are joined to the first pair of the sacral nerves.

## *The sacral nerve*

consist of five pairs, all of which arise from the cauda equina, or termination of the medulla spinalis, so called from the nerves resembling the tail of a horse. The four first pairs give off branches to the pelvic viscera, and are afterwards united to the last lumbar, to form a large plexus, which give off—

The ischiatic nerve, the largest in the body, which immediately at its origin sends off branches to the bladder, rectum, and parts of generation, proceeds from the cavity of the pelvis through the ischiatic notch, between the tuberosity of the ischium and great trochanter to the ham, where it is called the popliteal nerve. In the ham it divides into two branches.

1 The peroneal, which descends on the fibula, and distributes many branches to the muscles of the leg and back of the foot.

2 The tibial, which penetrates the gastrocnemius muscles to the internal ankle, passes through a notch in the os calcis to the sole of the foot, where it divides into an internal and external plantar nerve, which supply the muscles and aponeurosis of the foot and the toes.

The great intercostal or sympathetic nerve arises in the cavity of the cranium from the union of a branch of the sixth with a recurrent twig of the second branch of the fifth pair. It passes out of the cranium through the carotid canal,

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and descends on the sides of the cervical, dorsal, and lumbar vertebra and sacrum, in which course it is joined by filaments from all the spinal nerves, forming small ganglions at their junction.

In the neck it forms only three ganglions, which are called *cervicæ*.

1 The uppermost is situated upon the second vertebra behind the pharynx; it sends branches which concur in forming the pulmonary and cardiac plexuses, and several other twigs which unite with the vagus nerve, the par vagum, and the two other ganglions.

2 The middle ganglion, which is situated on the fourth cervical vertebra.

3 The lowermost ganglion, which is the least, and placed on the first cervical vertebra. The branch goes off from it, and surrounds the subclavian artery and several others, which unite with other branches from the par vagum, and form the cardiac plexus.

The trunk of the great intercostal then descends behind the subclavian artery by the sides of the transverse processes of the dorsal vertebra, through the cavity of the chest, receiving two branches from each of the dorsal nerves coming from the spinal marrow, as it passes along, and forming as many small ganglions quits the side of the vertebra, accompanies the aorta and having reached the sacrum, produces several ganglions, with the spinal branches coming from this part, and, lastly, is reflected inwards, about the coccygis, and joins its fellow of the opposite side. Having thus described the course of this nerve, so justly termed the great sympathetic, it still remains to enumerate the several abdominal plexuses which arise from it,—for the viscera of the abdomen are all supplied from the great intercostal.

The fifth dorsal ganglion of the intercostal sends off a nerve into the thorax, the third dorsal ganglion also sends off a nerve, a nerve proceeds from the seventh dorsal ganglion, another the eighth ganglion, and another from the ninth and tenth, or sometimes from the eleventh dorsal ganglion. These five branches, given off by the dorsal ganglia, descend in the thorax in the course of the vertebræ, and pass through the diaphragm into the abdomen, where they all unite into one trunk on each side, and this nerve is called the splanchnic, or before, or anterior intercostal.

The splanchnic intercostal nerve proceeds a very little way from the diaphragm and then produces a large ganglion on the arch or part of the aorta of a semilunar form termed the *semilunar ganglion*; some small twigs pass from it, and form a network, which is termed the solar plexus. The two semilunar ganglia send several branches to unite with and form the following abdominal ganglia:

1 The *cœliac plexus* surrounding the cœliac artery, and formed by the union of several branches from the solar plexus and semilunar ganglion.

2 The *hepatic plexus* arising from branches given off from the cœliac plexus, and uniting with those coming from the semilunar ganglion supplies the *vena portarum*, the gall bladder, liver, duodenum and omentum, with nerves.

3 The *splenic plexus* arising from branches given off from the cœliac plexus and right semilunar ganglion, and passing with the vessels into the spleen, whence it sends branches to the stomach and pancreas.

4 The superior mesenteric plexus formed by

the union of several branches from the semilunar and solar ganglion, and the former plexus sends nerves to the mesentery, mesocolon, and mesenteric glands.

5 The renal plexus formed by branches of the semilunar ganglions and the superior mesenteric plexus the kidneys are hence supplied.

6 The inferior mesenteric plexus situated near the inferior mesenteric artery.

7 The mesocolic, or posterior mesenteric plexus arising from the union of several nerves sent over the aorta from the superior mesenteric and renal plexuses, supplies the mesentery and intestines.

8 The hypogastric plexus formed by branches from the superior and inferior mesenteric plexus, and situated at the fourth vertebra of the loins soon divides into two branches, in each of which is a ganglion that sends nerves to the urinary bladder, rectum, and contiguous parts.

9 The spermatic plexus supplying the spermatic vessels, testes, ovaria, &c.

## SPLANCHNOLOGY, OR, DOCTRINE OF THE VISCERA.

By the viscera, or visceral organs, are generally understood the larger organs alone of the thorax and abdomen. Thin, however, and several other Roman writers have so far extended the term as to make it embrace every organ that lies beneath the common integument of the skin. The Greek term *σπλῆγχνα* which is synonymous with that of viscera, is capable were it necessary so to employ it, of an equal latitude. It is proper, however, to premise that in the present anatomical arrangement splanchnology or the doctrine of the viscera, is designed to include the general mass of the soft parts of an animal, not described under the foregoing divisions together with their respective appurtenances and involucre.

Splanchnology therefore thus considered may be contemplated under the four sections of the head, thorax, abdomen, and extremities.

### Head

The parts which form the head are divided into external and internal.

The external parts are the common integuments, hair, a tendinous expansion, three pair of muscles, pericranium, and cranium itself.

The internal parts are, the dura mater, menbrana vascularia pia mater, cerebrum, cerebellum, medulla oblongata nine pair of nerves, four arteries, and twenty two venous sinuses.

The dura mater, or meninx is a strong thick, fibrous, insensible membrane, situated immediately under the cranium to which it adheres very firmly, covering the external surface of the brain. It is composed of two strong membranous layers, or lamina. The external layer lines the internal surface of the cranium, supplying the place of periosteum. The internal layer is closely connected to the external by cellular structure, in many places, however, they are separated so as to form a space, or sinus, in which the blood passes as through veins to be returned towards the heart. The latter also forms several processes, the chief of which are the following.

1 The falx, or falciform process, or septum cerebri, which originates by a very firm attachment, from the middle of the sphenoid bone and crista galli, within the cranium, and rises up

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ward, like a bow, adhering to the external lamina of the dura mater immediately covering the middle of the frontal bone, the sphenoidal suture, and occipital bone until it arrives at the meeting of the internal crural spine of the occipital bone, where it unites to the tentorium. Its superior part contains the longitudinal sinus.

2 The tentorium or septum transversum, arising from the clinoid processes of the sphenoid bone and passing horizontally backward, being attached to the horizontal ridges of the crural spine of the occipital bone. It separates the cerebrum from the cerebellum.

The septum cerebri lying below the tentorium, like a continuation of the falx, and lying between the lobes of the cerebrum. There are several smaller processes which need not be mentioned.

The veins or sinuses of the dura mater are—

1 The longitudinal, which commences at the origin of the falx and passes within it, of a triangular form upwards, and immediately under the sagittal suture of the cranium to the occipital tubercle, where it bifurcates into the lateral sinuses.

Within this sinus are a number of tendinous fibres or trabeculae which cross the sinus in various directions from one side to another.

2 The lateral sinuses which are continued, one long each transverse or horizontal branch of the crural spine of the occiputis, downwards to the foramen lacerum in the cranium where they pass out of the cranium, and commence the two internal jugular veins.

3 The torulus cerebri a small vein or sinus on that part of the process formed by the meeting of the tentorium falx and septum cerebri, it proceeds directly backwards to the bifurcation of the longitudinal sinus.

Besides these there are many other small sinuses which we cannot at present notice.

The arteries of the dura mater are fully displayed in an arborescent form, the branches of the tri-arteria, the running anterior and posterior. No nerves have been satisfactorily discovered.

The membrana arachnoides, or tunica arachnoides, is very delicate and transparent, situated between the dura and pia mater and surrounding the cerebrum, cerebellum, medulla oblongata and spinalis. It resembles a spider web only near the basis of the cranium where it is very vascular. In other parts it is diaphanous like the pleura and peritoneum. It enters also the cavities of the brain, which it lines, and it forms the membrane covering the thalamus, nervus opticus, corpora striata, pedunculi hippocampi and fourth ventricle. Use unknown.

The pia mater, or meninx, is the third covering of the brain, cerebellum, medulla oblongata and spinalis, highly vascular and delicate, embracing those parts closely, penetrating between their convolutions, and sending a vast number of vessels to the cortical substance of the cerebrum and cerebellum.

The tomentum cerebri consists of the fine vessels that are sent from this membrane into the brain, which, when pulled out by artificial means, gives the internal surface of the pia mater a floccose appearance. Use not thoroughly known.

The cerebrum encephalon, sensorium commune, or brain, is a large viscus, somewhat of an oval figure, situated in the cavity of the cranium

that which is called brain in common language, consists of the cerebrum, cerebellum, and medulla oblongata.

The brain is composed of three substances the medullary, cortical, and blood substance. Some anatomists have enumerated a fourth.

1 The medullary is of a delicate white colour, it composes the greater part of the whole brain.

2 The cortical, called also circumscription, encloses the whole brain, and is found in many of the internal parts, the portion which covers the medullary part is highly vascular, receiving the vessels.

The blood substance is observed by making a transverse section through the crura cerebri, in the middle of which it is situated.

The cerebrum is divided by a large fissure into two hemispheres which are united both above and below by portions of the brain called commissures. The under surface of the brain is more irregular and presents a distinct fold which corresponds to the indentation, or to a notch, of the skull, so that the two inferior tables of the frontal bone, the two middle, and the two posterior lobes pass over the cerebellum to occupy the superior occipital depression. When the pia mater is removed the brain becomes as it were the appearance of an intricate convoluted snake up together there are spaces between the convolutions, or gyri, which allow the process of the pia mater to pass some way down, these are termed intergyal spaces of the brain. One of the convolutions going considerably deeper than the rest, and seen when a horizontal section of the brain is made below the corpus callosum, first noticed by Sylvius, has ever since been termed fissura magna Sylvii. Upon the under surface of the brain, between the middle lobes, two processes are sent downwards and backwards, like legs, these are termed the crura cerebri, they are soon encompassed by the crura cerebelli to form the pons Varolii. There are also two round white bodies seen before these, like two peas, called the corpora candidantia Willisii.

When the two hemispheres of the brain are separated a little from one another, a white substance presents itself, this is the commissura superior, it is also termed the corpus callosum, and commissura magna cerebri, and the elevated line running along its middle is the raphe. The commissura superior is covered by a portion of the hemispheres of the brain, which layer, as it were, over it on each side, the portions are termed the lobes cerebri. When the hemispheres of the cerebrum are cut away in a direct line with the exterior of the commissura superior, a large surface of the medullary substance is brought into view, this is the centum ovale, the commissura superior cerebri, its raphe and striae, and the cortical substance of the brain, may now be examined minutely.

There are four cavities within the remaining portion of the cerebrum called ventricles, two of these situated laterally, are called lateral ventricles, at their upper part they are separated from each other by a very delicate partition, in which is another cavity, but inferiorly they are at a greater distance from each other, so that all of a considerable portion of brain and cavity to be situated between them, and this cavity is the third ventricle.

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A incision must now be made on either side of the raphe of the corpus striatum superior cerebri, into one of the lateral ventricles and its upper and outer parietes removed so as to completely expose the cavity. It is termed the lateral ventricle from its situation; its figure is triangular, having three sinuses or horns, hence it is also called the tricorn cavity. The following are to be noticed in each lateral ventricle.

1 A very delicate and pellucid membrane separating one cavity from the other called septum lucidum. There is occasionally a small cavity between the laminae composing the septum called the fifth ventricle by physicians.

2 A convex brown coloured body at the anterior sinus, called corpus striatum. It is of a pyriform shape, its round end turned toward the face, and its taper end or crura, backward.

3 A portion of a white convex body, the thalamus nervi optici situated behind the former, and separated from it by an opaque line in which there is a blood vessel. The line of separation is called geminum centurium semicirculare, and tænia semicircularis.

A part only of the thalamus nervi optici is seen in this ventricle. The line of separation separates the lateral ventricle from the third ventricle. The greater part of each thalamus is in the third ventricle.

4 A small substance lying between these parts and the bottom of the septum lucidum, termed plexus choroideus. This plexus comes into the lateral ventricle at its superior and anterior cornu, and the hole through which it comes is the foramen Monroianum.

The choroid plexus passes over the portion of the thalamus of the optic nerve in this ventricle, into the inferior cornu.

5 The corpus fimbriatum, a flat tape like substance, which goes downwards from the bottom of the septum lucidum into the posterior and inferior horns of this cavity.

6 The unguis, or hippocampus minor, a convex body like the nail of the little finger, situated in the posterior horn of the ventricle, and arising from the corpus fimbriatum.

7 The pes hippocampi, called also cornu terminale and hippocampus major, a long convex substance occupying the whole of the inferior cornu and arising from the corpus fimbriatum.

8 A number of columns, more evident in some brains than in others, passing round the superior and posterior parietes of the lateral ventricle, called columna anonyma.

The fornix lies at the bottom of the septum lucidum, which arises by the inside of each corpus striatum, and passes upwards and backwards like an arch, and then divides posteriorly, and all this in less than the space of an inch. It is supported by two pillars, about a quarter of an inch in length of the thickness of a crow quill, one from each side below the corpus striatum. These are called its anterior crura. They are connected by a medullary substance. Having passed over the choroid plexus, the crura unite and continue united in a very little way, they then separate, and proceed backwards and outwards, by the name of the posterior crura of the fornix, and are soon stretched when they become the corpora fimbriata, which pass round into the posterior and inferior horns of the lateral ventricles.

The space between the posterior crura of the fornix is triangular, and marked with a number of depressed lines, not always conspicuous, it is termed the psalterium or lyra from its supposed resemblance to David's harp. These circumstances are seen by dividing the two anterior crura of the fornix and turning it backward with the septum lucidum and commissura superior cerebri.

The lamina or net-work of vessels lying over the third ventricle in contact with the fornix and psalterium, is called velum interpositum. In it are two veins, the vena magna Cæli which is just before the interior and return their blood into the tricuspid of Herophilus.

When the choroid plexus is removed, the space or cavity is perceived between two large rounded bodies which have the appearance of a pair of testicles.

The whole is now brown at first, and afterwards here and there one or two elevations on the bulbous, and sometimes in the portion within the lateral ventricle, and one under the corpus striatum, these are termed the collicle of the thalamus nervorum opticoarum. In this division are to be noticed.

1 The commissura anterior cerebri, or anterior commissure. This is a band like a nerve, the thickness of a crow quill, going across the anterior part of the third ventricle, and uniting it were, one side of the cerebrum to the other. It lies horizontally immediately below the anterior crura of the fornix.

2 The third ventricle runs forward and this commissure becoming smaller until it terminates in a slender red substance, which sometimes solid and sometimes hollow. This final shaped portion is the iter ad infundibulum. It ends in the pituitary gland situated in the sella turcica.

3 The bottom of the third ventricle is formed by a portion of the medullary substance of the brain going across from one side to the other, in the same way as the commissura superior does. It is therefore termed the commissura inferior cerebri.

4 The elevated eminence on the side of each thalamus nervi optici in the third ventricle, which is backward, these meet posteriorly, and have a small, heart shaped, pulpy substance attached to them which is the pineal gland, the lines are termed the peduncles, or crura of the pineal gland.

Before the gland and below its crura is a nervous band opposed to that in the anterior part of the ventricle called commissura posterior cerebri. It cannot be traced penetrating the brain like the anterior.

6 Immediately under this commissure is an opening, opposed to the iter ad infundibulum which penetrates through the medulla oblongata and is termed the iter tertium ad quartum ventriculum, or aqueduct of Sylvius.

Behind the posterior commissure are four rounded eminences, called corpora quadrigemina, two are situated superiorly, and two inferiorly, they were formerly called nates and testes.

The third ventricle is lined by a delicate membrane, a reflection of the pia mater, or membrana arachnoides, which secretes the subtle vapour by which it is lubricated.



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The cerebral nerves, &c have been already described.

The cerebellum, or little brain, is of a round figure, and situated under the tentorium of the dura mater in the inferior occipital depressions. It is divided into two lobes by a process of the dura mater, and sends four processes, or crura, forwards which, with the crura of the cerebrum, appear to constitute the *medulla oblongata*. The cerebellum is composed, like the brain of a cortical substance and a medullary, and is closely covered by the pia mater which sends processes between its convolutions that appear more regular than the convolutions of the cerebrum. These first divide the external surface of the cerebellum into laminae, and the laminae into smaller parts like the leaf of the cerebellum. The cerebellum is covered by the arachnoid of the cortical substance, and the appearance of it is like its brain, and it is covered by the pia mater. There is a cerebellar sulcus between the cerebellum and the cerebrum, and the cerebellum is wider than the cerebrum. The two lobes of the cerebellum are separated internally by a longitudinal process the *torus vermis*, which has a continuation which is hindered by the *pons Varolii*, and the *medulla oblongata* is continued into the fourth ventricle, formed a narrow tube, medial along its posterior and lateral by the cerebellum, hence it is common to both in it are to be observed—

1 A thin milky portion connecting the medulla oblongata to the cerebellum, and lying immediately between the crura, superiorly and above the upper part of the *torus vermis*, and the fourth ventricle, this is called the *velum of the cerebellum*.

2 A plexus of vessels, and apparently small glands called the *plexus of the cerebellum*.

3 A depressed line extending from the medulla oblongata in the cavity, which is called the *caulus scriptorius*.

4 Two or three delicate white cords like nerves which are the origins of the *truncus vermis*, or auditory nerve.

The vermiform processes are situated in front and behind the crura cerebelli and are merely a portion of the cerebellum more protuberant than the rest whose convolutions are bunched round like a number of small worms.

The medulla oblongata is a white firm, medullary substance situated beneath the cerebrum and before the cerebellum, and lying upon the coniform process of the occipital bone. It is broad and rounded above, and narrower below, where it is continued into the medulla spinalis. From its appearance it favours the idea of its being formed by the crura cerebelli in its middle encompassed by the crura cerebelli becoming flattened as they pass over the former. Upon its anterior surface are to be observed—

1 The *pons Varolii*, called also *corpus innulare*, which forms the upper and anterior part, it is convex, and covered with many striæ. The basilar artery runs over it.

2 The *corpora pyramidalia*. Two eminences proceeding from the *pons Varolii* towards the medulla spinalis.

3 The *corpora olivaria*. Two more oval eminences, one on each side the *corpora pyramidalia*, from which they are divided by a sulcus.

Through the middle of the *truncus vermis* of longata, just before the corpora quadrigemina the *arteria tertia ad quatuor ventriculorum* is to be noticed.

The different pairs of nerves &c originating from the origins have been noticed already.

The spinal marrow is a continuation of the medulla oblongata, beginning from the *protopharyngeal foramen* and passing down the vertebral canal, thence it divides into cervical, dorsal and lumbosacral, where it terminates in two numbers of long nerves which, from their resemblance to a horse tail, are called the *cauda equina*. It is composed, like the brain, cerebellum and medulla oblongata of nervous matter which is distinguished into medullary and cortical substance. The medullary substance is the latter internal part, and the cortical substance is the spinal marrow, which is covered by the pia mater, tunica arachnoid, and there is a ligamentum denticulatum, and the interstices of the origin of the spinal nerves, the first cervical to the twelfth dorsal, are called the *ligamentum seriatum*, or *denticulatum*. The nerves are off by the spinal marrow have been already considered. The *plexus vermis*, and *torus vermis*, are appointed to the *plexus vermis* and *torus vermis* of its distinct powers.

The *plexus vermis* is divided into

1 A thin milky portion connecting the medulla oblongata to the cerebellum, and lying immediately between the crura, superiorly and above the upper part of the *torus vermis*, and the fourth ventricle, this is called the *velum of the cerebellum*.

2 The *eyelids*, two serous productions, covered internally by the conjunctive membrane and Meibomius glands, and formed externally by common integuments and cartilage extremely moveable, especially the upper. The cartilage between the conjunctive membrane and the common integuments of the eyelid is semi-lunar and termed *tarsus*. The edges of the eyelids have a number of short hairs arising from them and turned outwards, called *cilia*, or *cylindri*. The use of the eyelids is to cover the eyes during sleep, to defend them from dust and other substances, and too strong rays of light, and to lubricate the conjunctiva by frequently moving its secretion over the surface of the eye.

3 The *pusilla lachrymalis*, two small orifices, one at the end of each eyelid near the nose. A canal goes thence downwards and inwards, and meeting about half an inch from then origin, they form a sac, called *sacculus lachrymalis* which is continued downwards through the *ductus nasalis* into the nose. The tears are absorbed by the *pusilla lachrymalis* and conveyed into the nose through the sac and canal.

4 The *lacrimal gland* is situated in the superior part of the orbit in a peculiar depression, hard, conical, of an oval form, with a number of excretory ducts which convey the fluid called *tears* secreted by this gland, on the surface of the eye.

5 The *caruncula lachrymalis*, a small red tubercle in the internal canthus of each eye. It has a number of hairs and secretes a *meagma* it is also of use to direct the tears into the *puncta lachrymalia*.

6 The *tunica conjunctiva*, a transparent vascular membrane, reflected from the edge of one eyelid over the internal part of the eyelid across

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the bulb, to which it adheres very firmly, and then over the internal part of the other eyelid to its edge more loosely connected with the eyelids than the eye, where it passes the cornea transparent, adheres so firmly that it cannot be separated use to lubricate the eye by the moisture secreted from its transparent arteries

The internal parts of the eye are termed the bulb, they constitute the eye, properly so called, and are—

1 The sclerotic membrane A very firm, hard, white, horny tunic into which the muscles of the eye are inserted anterior part glossy and transparent, and projecting, it is called cornea transparent, to distinguish it from the other part, called cornea opaca The optic nerve is inserted into the posterior part of the sclerotic membrane which appears to be an expansion of its external tunic, continued from the dura mater

2 Immediately under the sclerotic is a very vascular soft, and rough membrane, called the membrane or tunica choroides It adheres to the sclerotic from the optic nerve all around to the edge of the transparent cornea by vessels, but when it arrives here, instead of being continued around the concavity of the cornea transparent, it passes straight downwards and inwards, forming the coloured part of the eye which is sometimes black, blue, &c This black or blue part is called the iris, which possesses a contractile power, by some supposed to arise from muscular fibres, so as to enlarge or contract the opening in its middle which is the pupil The edge of the choroid membrane that adheres to the white of the cornea transparent is covered with a white line to which the name of ciliary circle or ligament is given Some anatomists have supposed the choroid membrane was formed of two laminae The posterior surface of the iris is termed the uvea

3 The posterior surface of the tunica choroides is covered with a black mucus known by the name of the pigment of the choroid membrane and uvea

4 Upon the inside of the choroid membrane, corresponding to the ciliary circle on the outside are a number of white striae, which are called ciliary processes

5 The iris is a whitish, pulpy vascular membrane covering the pigment of the choroides, which is the immediate organ of vision and called the retina It passes forward from the optic nerve, and terminates in the ciliary process

The membranes which have been described are distended with the vitreous humour crystalline lens, and aqueous humour

1 The vitreous humour or substance is a soft, round and very transparent body filling the whole hollow surface of the globe It is a cavity in its anterior surface, and is surrounded with a delicate hyaloid membrane which sends a number of laminae, internally forming cells, which are distended with a transparent fluid

2 The crystalline lens lies in the depression in the anterior part of the vitreous humour It is a solid, transparent body, like ice, and is enclosed in a capsule

3 The aqueous humour is very fluid and transparent and fills the space between the crystalline lens and the cornea transparent

The space between the anterior surface of the crystalline lens and posterior surface of the transparent cornea, has the iris hanging like a

curtain in its middle, and which divides it into two spaces these spaces are distinguished by the name of anterior and posterior chambers

The ear is distinguished into external and internal

The external ear is formed of an oval cartilage, concave before, having several eminences and depressions and convex behind, covered with common integuments

1 The external ridge is called the helix, it curls inwards 2 The antitrichia, a ridge situated more internally than the helix 3 The concha, or cavity bounded by the antitrichia and tragus 4 The tragus a cartilaginous eminence covered with long hairs 5 The antitragus a small depression opposite to the tragus, at the bottom of the antitrichia 6 The lobule of the ear, which hangs downwards and is bored for rings

The bony meatus auditorius of the ear is lined by a cartilage and common integuments, between which are the glands that secrete the wax This canal the meatus auditorius externus, is terminated by a membrane of the tympanum

Its muscles and ligaments have been described already

The internal ear lies concealed within the petrous portion of the temporal bone it is divided into the tympanum, mastoid cells, and labyrinth

The tympanum is an irregularly round cavity covered by a muscle called the tensor tympani, like a drum by its parchment It contains four delicate bones, which together with its muscles have been described already

The labyrinth is composed of the cochlea, vestibulum, and semicircular canals, these have also been described already The vestibulum is a cavity bounded by the semicircular canals, and contains four delicate bones, which together with its muscles have been described already

The membranous semicircular canals, which are situated within the bony semicircular canals and loosely connected to the pericranium by fine cellular membranes, contain a quantity of fluid being interspersed, which communicates through the labyrinth

The nose is divided into external and internal The former is the part which is directed to the front and lateral, and the latter into two nostrils five cartilages the front, lateral, and alar

1 Root, the superior part contiguous to the forehead

2 Back or bridge, the middle prominence, which goes downwards

3 Alæ, or pinnae, the lateral and moveable parts

4 Apex or tip the inferior round part

5 The lateral parts of the nose are, one in the middle, which with the vomer complete the septum narium, and two on each side of the septum, which form the round tip, and opening in to the nostrils

6 The frontal sinuses communicate with the superior part of the nostrils

7 The sphenoidal sinus opens into the posterior nostrils

8 The maxillary sinuses open into the anterior nostrils at their sides

9 Besides these parts the nostrils have the turbinated portions of the ethmoid bone and the inferior maxillary bones, hanging within them and

10 The opening of the ductus ad nasum All these parts are covered with a very vascular

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lar pituitary membrane, called the Schneiderian, from its discoverer, upon which the excretory ducts of the mucous glands open, and the olfactory nerves are beautifully distributed so that the pituitary membrane not only covers the nostrils, but the sinuses communicating with them.

The cavity of the mouth is covered by the cheeks and lips.

The cheeks are composed of common integuments and various muscles going downwards from under the eye, over the superior maxillary, to the inferior maxillary bone.

The lips are composed of common integuments and muscles and are highly vascular, which gives them their beautiful redness in health. The commisure of the lips is the angles in which they meet.

The cavity of the mouth is bounded superiorly by the hard and soft palate, inferiorly by the tongue, anteriorly and laterally by the teeth, and posteriorly it is open communicating with the fauces, hence these organs are to be considered in the present section.

1 The gums are a red, vascular, spongy substance of a peculiar nature, encompassing the necks of the teeth, and lying on each side the alveolar processes.

2 The roof of the mouth is called the palate, the anterior portion is much harder than the posterior being partly formed of bone and hence distinguished into hard and soft. The hard palate is that portion of the roof which is formed by the palatine bones and palatine portions of the superior maxillary bones, it is covered with perosteum and the common membrane of the mouth, which is formed into rugæ. The soft palate, or velum pendulum palati extends backwards from the hard palate forming two arches it is composed of the internal membrane of the mouth a number of glands and muscles. From the middle of the velum pendulum palatinum there hangs down over the tongue a conical body like a nipple, seen when the mouth is opened, which is the uvula. From the sides of the uvula, towards the sides of the tongue the soft palate forms two arches the interior of these is fixed to the sides of the tongue but the posterior extends backwards to be inserted into the pharynx. Between these two arches, on each side at their bottom, is an oblong gland called the tonsil, it has several excretory ducts opening upon its surface.

The membrane covering the mouth is a reflection of the skin and epidermis it is very spongy and cellular, having a number of small glands under it, and their excretory ducts opening upon its surface.

The mouth is the organ of mastication and deglutition. It also affords a passage to the air in breathing, and assists in forming the sounds for speaking.

The tongue is a muscular body moveable in every direction, and situated in the inferior part of the mouth.

It is divided into a base, body, back, an inferior surface, and two sides.

The base lies on the os hyoides.

The body is the middle and larger part.

The superior surface is called the back.

The inferior surface is connected to the parts below by the membrane of the mouth which forms a bridle, or frenulum, behind the middle incisors.

The tongue is formed of a number of muscular

fibres, which are considered in Myology, covered by the common integuments.

The external surface is every where covered with nervous papillæ, some of which are pyramidal others conoid, and some fungiform, they are most numerous on the sides and apex, and upon the middle of the back.

The fauces are the cavity behind the soft palate and tongue, which ends in the pharynx.

It is bounded posteriorly by the bodies of all the cervical vertebrae, superiorly by the cuneiform process of the os occipitis and middle of the sphenoid bone inferiorly by the pharynx, and anteriorly it looks into the mouth.

The posterior nostrils open into the fauces behind the velum pendulum palati.

The Eustachian tubes have apertures at their sides.

The whole of this cavity is lined with a very vascular and mucous membrane continued from the mouth and nostrils on which are the opening of many mucous glands.

The pharynx is a muscular sac, like a funnel, situated behind the larynx, adhering to the fauces, and terminating in the œsophagus.

The œsophagus, or gullet, as an appendage to the organ of taste, is entitled to be considered in this section. It is a membranous and muscular tube, situated between the pharynx and stomach, and descending behind the trachea down the neck, and along the posterior space of the mediastinum into the abdomen.

It is composed of three tunics, or coats—

1 A common tunic, which is a condensed cellular membrane.

2 A muscular one, which consists of very dilatable muscular rings.

3 A villous coat, situated on the inside between this and the former tunic. Are a number of muciparous glands which secrete the mucus of the œsophagus.

The larynx is a hollow body, composed of cartilages, muscles, and ligaments, situated at the root of the tongue, in the fore part of the neck.

It is attached above to the os hyoides by muscles and ligaments and posteriorly to the basis of the tongue by membrane, and to the pharynx by various muscles.

11 cartilages which form the larynx are

1 The thyroid or scutiform, which forms the anterior and superior part, and by far the greater part of the larynx. It appears to consist of two cartilages joined together anteriorly, which form a projection in the milk neck, called the pomum Adami, but which recede from each other in the posterior part. At the upper end of each posteriorly is a little projection these are termed the cornua of the thyroid cartilage, they are joined to the cornua of the os hyoides by a ligament.

2 Two arytenoid cartilages found behind the former, placed perpendicularly upon the cricoid, and forming a space between them, the opening into the larynx, called glottis, or rima glottidis.

3 The cricoid cartilage which is the basis of the others it is narrow before, and broad behind, and is immediately above the larynx.

4 The epiglottis, an oval cartilage at the root of the tongue, which covers the glottis when the food passes into the pharynx.

The larynx is every where covered with a very sensible vascular and mucous membrane a continuation of the membrane of the mouth.

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The trachea is a tube originating from the larynx in the anterior part of the neck, before the œsophagus, and passing into the thorax, where it divides into two branches, called bronchia.

It is composed of cartilages, muscles, and membranes.

1 The cartilages are round, but not complete rings, for they are fleshy posteriorly, where they lie over the œsophagus.

2 The muscles of the trachea pass between these rings, and are called mesochondriac.

3 The internal surface of this tube is lined with an exquisitely sensible and vascular mucous membrane continued from the larynx.

The bronchia entering the substance of the lungs, divide into innumerable little branches, which terminate in the vesiculæ pulmonales, or air cells.

The neck is formed internally by the fauces, pharynx, œsophagus, larynx, and trachea externally by the common integuments, muscles, nerves, and bloodvessels.

## Thorax

The thorax, or chest, is that part of the body situated between the neck and belly, and to whose sides the upper extremities are attached. Its figure is pyramidal, broad and convex below, where it is separated by the diaphragm from the abdomen, and obtuse above, where it is terminated by the pleura, cellular structure, muscles, and vessels, hollow behind, owing to the convexity of the ribs as they approach the spine, convex laterally, somewhat flattened in front.

It is divided internally into five cavities.

1 A right and left cavity.

2 The cavity of the pericardium.

3 The anterior space of the mediastinum.

4 The posterior space of the mediastinum.

The parts which constitute the chest are divided into external and internal—

The external parts are the common integuments, the breasts, various muscles, and bones.

The internal parts, or proper viscera, of the thorax are, the pleura, the lungs, the thymus gland, the œsophagus, ductus thoracicus, arch of the aorta, branches of the venæ cavæ, the venæ azygos, par vagum, and great intercostal nerves.

The breasts, or mammæ, are two soft hemispheres, adhering to the anterior and lateral parts of the chest over the pectoral muscle. In men, they are termed mamillæ, in women, mammæ, and in brutes, ubera.

The human breast is composed of much soft fat, which gives it the rotundity, and is of a glandular fabric, plentifully supplied with blood vessels, nerves, &c. which secrete the milk, and convey it by its excretory ducts to

The papilla, or nipple, a very irritable prominent body, in the centre of each breast, in which the excretory ducts of the glands of the breast, called galactophorous and lactiferous, open.

The nipple is surrounded by a brown circle, called the areola, or halo.

The use of these organs in the female is to secrete and contain the milk for new born infants. In the male the use is not known.

The pleura is a transparent smooth membrane, which lines the internal surface of each lateral cavity of the thorax, and covers its viscera. Its external surface is attached by vessels and cellular membrane to the ribs, intercostal muscles, sternum, bodies of the dorsal vertebrae and dia-

phragm, so that it may be compared to two bags. Of these the right lies close to the internal surface of the ribs, down to the diaphragm, passes over it, giving it a tunic, and having reached the heart bag, near the middle of the inferior part of the chest, adheres to it, and goes up to the sternum, to the very top of the chest where the bronchia enter, and the lungs begin, and in this part the pleura is reflected over them—the left bag lines the left cavity in the same way. The pleuræ of both cavities at the sides of the bodies of the vertebrae go directly forwards to the sternum, without coming into contact with one another, a vast quantity of cellular structure being interposed and thus divide the thorax into a right and left cavity. This partition of the chest is termed mediastinum, in which are two spaces: the anterior space is directly behind the sternum, the posterior immediately before the bodies of the dorsal vertebrae.

The mediastinum is a membranous partition formed of a duplicate of the pleura, which divides the chest into two cavities.

In the mediastinum that is, between the two pleuræ of which it is formed are—in the interior part, the pericardium, the thymus gland in children—in the posterior part, the œsophagus, large vessels of the heart, the par vagum, great intercostals, and thoracic duct.

The lungs are situated in the cavities of the thorax, and are the chief organs of respiration. They are divided into right and left lung: the right has three lobes, the left only two.

The substance of the lungs is bronchial, vascular, vascular, nervous, glandular, and parenchymatous.

1 The bronchia are continuations of the trachea, and are formed exactly of the same material, viz cartilage and intercartilaginous muscles.

2 The vesicles of the lungs are called the pulmonary or air vesicles, they form by far the greater bulk of the lungs, and are placed at the very extremities of the ramifications of the bronchia, being apparently formed of the internal membrane lining the bronchia. It is on the internal surface of these vesicles that the pulmonary artery forms a beautiful plexus of delicate vessels.

3 The vessels of the lungs are—the pulmonary artery, whose ramifications are very numerous forming a net of vessels on the internal surface of the air vesicles—the pulmonary veins, which return the blood from the pulmonary arteries—the bronchial artery, which nourishes the lungs, and returns its blood through corresponding veins into the venæ azygos—the absorbents of the lungs, which are deep-seated and superficial.

4 The nerves of the lungs are derived from the par vagum and great intercostal, and form an anterior and posterior pulmonary plexus.

5 The glands about the bronchia are very numerous, and termed bronchial. Lymphatic glands are also found more internally.

6 The parenchyma of the lungs, or cellular membrane, connects the vessels, bronchia, and vesicles, and is very elastic.

The lungs are connected with the heart by means of the pulmonary artery and veins, and with the trachea by means of the bronchia, the other part is loose in the cavity of the chest, having a coat from the pleura, called pleura pulmonalis.

The pericardium is a membranous sac surrounding the heart.

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It adheres to the diaphragm, pleura, sternum, cartilages of the ribs, œsophagus, aorta descending, and the veins and great arteries going to and from the heart. Its use is

To contain the heart and to separate a fluid which may lubricate and preserve it from concretion with the pericardium.

The heart in adults is a hollow muscular viscus, situated in the cavity of the pericardium, by whose contractile power the blood is sent to every part of the body. It is distinguished in the dead body, whilst in the pericardium, into an anterior and posterior surface and margins, a base from which the large arteries emerge, and an apex. In the living body the base of the heart is towards the dorsal vertebrae, its apex towards the sixth rib of the left side, so that its situation is oblique, not transverse, the right ventricle being anterior, the left posterior and the inferior surface lying upon the diaphragm.

The heart is divided into two auricles, which lie upon its base surrounding the larger arteries, two ventricles, or cavities, in the internal part, and the arteries and veins going from and terminating in it.

The right auricle is a large muscular sac, in which the superior vena cava, and the inferior, terminate. It has a little process or cul de sac, like an auricle, or little ear, from which it took its name and an opening at its bottom into the right ventricle.

In the right auricle are

1 The tuberculum loweri. A mere projection in the auricle, between the two venæ cavae.

2 The valve of Iustachius. A production of the inner membrane of the inferior vena cava at its termination in the auricle. It is not always present, but in most instances is as complete a valve as any other.

3 The fleshy bundles crossing the auricle like the teeth of a comb, called *musculi pectinati*. Between the fascicles the auricle is transparent and membranous.

4 The valve of the great coronary vein, which opens into this auricle.

5 Around the opening of the auricle into the right ventricle, and rather within the auricle, is a tendinous circle.

6 A flat, membranous, oval depression, more remarkable in some than in other hearts, which points out the former situation of the foramen ovale.

7 The foramina Thebesii, which are seldom seen. They are the minute openings, probably arteries opening into the right auricle.

The right ventricle is a large cavity within the heart and below the auricle. The right auricle opens into it, and the pulmonary artery emerges from it. In this cavity are to be noticed—

1 The muscular pillars or columns called *carneæ columnæ*, which cross one another in every direction and have deep grooves between them.

2 The *corde tendinæ*, which connect some of the *carneæ columnæ* with the valves, and insert others into the parietes of the heart.

3 The tricuspid, or *triglochin* valves, which arise from the tendinous circle around the opening of the auricle, into the ventricle and form three points, which are fastened by the *corde tendinæ* to the parietes of the right ventricle.

4 The reticulated appearance of the *carneæ columnæ*, and the smooth surface leading to the artery.

5 Three semilunar valves placed just within the pulmonary artery. In the middle of each valve is a hard knot, called *corpus semilunare auranti*.

The left auricle is not so capacious as the right, it has no communication with it in a natural state, yet the foramen ovale, which is always open in the fetus sometimes remains so throughout life, or is forced open. The four pulmonary veins open into this cavity. It presents the fasciculated appearance of *musculi pectinati*, though not so strongly as the right auricle. The opening of this auricle into the ventricle is less than that of the right auricle, but it is surrounded by a tendinous circle in the same way.

The left ventricle is less than the right, its fleshy walls, or parietes, are much stronger and it has, like the right, an opening from the auricle, and an artery arising from it. In this ventricle we observe—

1 The valve arising from the circle of the auricular opening, which terminates in two fasciculi of tendons, and hence is called, from its resemblance to a bishop's mitre *valvula mitralis*. The two points are connected to the *carneæ columnæ*.

2 The *carneæ columnæ* are here remarkably strong and rounded and the *corde tendinæ* very firm.

3 The smooth surface towards the arterial opening.

4 The semilunar valves, just within the artery, or aorta, with the *corpora semilunaria* in their middle.

From this description of the heart, it appears that the auricles are separated from each other, and also the ventricles. The partition between the auricles is thin and partly membranous but that between the ventricles is about half an inch in thickness, and composed of strong fleshy fibres. The former is termed *septum auricularum*, the latter *septum ventriculorum*.

The structure of the heart is entirely muscular and well supplied with vessels, its cavity is lined by a smooth and very irritable membrane, continued from the internal coat of the arteries and vein, and its external surface is covered by a reflection of the internal tunic of the pericardium.

## Abdomen

The cavity thus denominated is situated between the thorax and pelvis, and is divided into several regions. The external parts are the common incipments, five pairs of abdominal muscles, and the peritonæum. The internal parts or viscera more properly so called are the omentum, stomach, small and large intestines, liver, gall-bladder, mesentery, lacteal vessels, spleen, pancreas, kidneys, suprarenal glands, part of the aorta descending, and vena cava ascendens.

The peritonæum is a smooth, delicate membrane lining the internal surface of the abdomen, and covering all its viscera.

It is connected, by means of cellular membrane, with the diaphragm, abdominal muscles, vertebrae of the loins, bones of the pelvis, urinary bladder, uterus, intestinum rectum, and all the viscera of the abdomen. Its use is to contain and sustain the abdominal viscera, and to excrete a vapour to lubricate them.

The omentum, or epiploon, is an adipose membrane, a production of the peritonæum attached to the stomach, and lying on the anterior surface of the intestines.

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It is divided into large and small. The former hangs pendulous from the great curvature of the stomach. The small omentum fills up the space between the small curvature of the stomach and liver.

Immediately behind the biliary ducts there is an opening in the omentum, which will admit the finger, called the foramen of Winslow. The foramen serves to lubricate the intestines, and to preserve them from concretion.

The stomach is a membranous receptacle, situated in the epigastric region which receives the ingesta from the oesophagus. It is divided, when empty, into an interior and a posterior surface, a great and little curvature, the cardia, or superior opening, and the pylorus, or inferior opening. It is connected with the oesophagus, duodenum, omentum and pancreas, and is composed of three membranes or coats, viz. a peritoneal muscular, and villous coat. Its use is to receive the ingesta from the oesophagus, and to retain, mix, digest, and expel it into the duodenum.

The luteal tubes are a membranous tube, six times longer than the body in the cavity of the abdomen, variously contorted from the pylorus of the stomach to the anus. They are divided into small and large. The small are,

1st The duodenum, which begins at the pylorus of the stomach and is reflected over the spine under the peritoneum. It is about twelve fingers breadth in length, and has an oblique perforation near its middle, which is the common opening of the pancreatic duct and ductus communis choledochus.

2d The jejunum and ileum compose the remainder of the small intestines. These intestines always hang from the mesentery, the greater part of them into the cavity of the pelvis. There is no material alteration of structure in any part of them: the termination of the one and beginning of the other is imaginary. The jejunum constitutes the first half from the duodenum, the other half is ileum. The small intestines have internally a number of annular folds which augment the surface for the situation of the lacteal and other vessels, these are called *valvulae conniventes* and are peculiar to the small intestines; they are most numerous in the duodenum, and least so in the ileum.

The large intestines are distinguished into,

1st. The cæcum, which lies upon the right hip over the iliacus internus muscle, to which it is attached by cellular membrane. It is a large cul de sac the small intestine opens obliquely into it, in such a manner as to form a valve to impede the return of the feces and nearly opposite to this valve there arises from the cæcum a small vermiform canal, imperforated at its extremity, called the *appendicula cæci vermiformis*.

2d. The ascending portion of the large intestine is the colon; it proceeds towards the liver by the frame of the ascending portion of the colon, and having reached the liver, forms a transverse arch across to the other side. The colon then descends, forming what is termed its sigmoid flexure into the pelvis, where the gut is called.

3d. The rectum, which terminates in the anus. The large intestines are lobulated, have sometimes little fat portions adhering to them called *appendiculae epiploicae*, and also three longitudinal bands upon their external surface.

The intestines are composed of three membranes, or coats, a peritoneal, a muscular, and a villous. They are connected with the mesentery,

kidneys, os coccygis, and urinary bladder, and in women with the vagina.

The lacteal vessels arise from the small intestines, and run into the mesenteric glands. The use of the intestines is to receive the chyme, and retain it for a time, to mix it with the enteric juice and bile, to separate and propel the chyle into the lacteal vessels, and to eliminate the feces.

The mesentery is a membranous production, formed of two laminae of peritoneum, between which are a quantity of cellular or adipose membrane, numerous glands, lacteals, lymphatics, arteries, veins, and nerves. It is distinguished into mesentery, hanging by its ligaments to the three superior lumbar vertebrae, and has the small intestines hanging to it, mesocolon, which supports the colon and mesorectum, a portion in the pelvis, enclosing the rectum.

The liver is the largest of all the abdominal viscera, it is of a deep red colour, and situated in the right hypochondriac region, and somewhat in the epigastric, hanging by its ligaments from the diaphragm. It is convex above and concave below, superiorly extremely broad but gradually becoming thinner inferiorly, and ending in a thin margin. Its surfaces are smooth, being covered by the peritoneum, which forms its several ligaments viz. two which are attached to the diaphragm and are termed lateral, in the middle of its lower and anterior margin is a round ligament adhering to the navel, through which the umbilical vein, &c. of the fetus passed between the round ligament and the diaphragm is another called the suspensory ligament, which adheres to the peritoneum of the anterior part of the abdomen. It is divided into three lobes, one of which is very large, the other smaller, and a third very small and called, after its describer Spigelian, or lobulus Spigelii. The liver is a gland composed of arteries, veins, nerves, lymphatics, and excretory ducts, united together by a particular substance there is also an appendage on the concave surface of the liver called the gall bladder.

The gall bladder is an oblong membranous receptacle, situated under the liver, to which it adheres very firmly, in the right hypochondrium. It is divided into bottom, body, and neck, which terminate in the ductus cysticus. This latter arises from the gall bladder, proceeds towards the duodenum and unites with the ductus hepaticus, to form the ductus communis choledochus which perforates the duodenum, and conveys the bile into the intestine. The gall bladder is composed of three membranes, a common, fibrous or muscular, and villous. Its use is to retain the gall, which regurgitates from the hepatic duct, there to become thicker, more bitter and acrid, and to expel it, when wanted, into the duodenum.

The spleen is a spongy, somewhat oblong viscus, of a bluish red colour, situated in the left hypochondrium, near the fundus of the stomach, under the ribs. Its use is not known.

The pancreas is a glandular body, of a long figure, resembling a dog's tongue, situated in the epigastric region, under the stomach. It is composed of innumerable small glands, the excretory ducts of which unite and form the pancreatic duct.

The pancreatic duct perforates the duodenum with the ductus communis choledochus, and conveys its secretion into the intestines. This secretion resembling saliva is carried into the duodenum.

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The lacteals are absorbent vessels of the mesentery which convey the chyle, a milk like fluid, from the intestines into the thoracic duct. They originate from the surface of the duodenum, jejunum, and ileum, and terminate in the thoracic duct, or trunk of the absorbents, which runs near the aorta on the spine, and empties its contents into the jugular vein. As they run through the mesentery, they pass through a number of glands, in which the chyle is altered, and then proceed to the trunk.

The kidneys are two somewhat oval viscera, situated behind the sac of the peritoneum, near the bodies of the superior lumbar vertebrae, which secrete the urine. They are divided into three kinds of substances: a cortical, which is external and very vascular, a papillous, which ends in several papillae or nipples in the pelvis, a tubular, which goes from the cortical to the papillous substance, and into a hollow part called the pelvis, lined by a smooth membrane, termed the pelvis of the ureter, which ends in the ureter. Their integuments are an adipose membrane, and a membrana propria. They secrete the urine and convey it to the bladder.

The renal capsules, or renal glands, are two triangular flat bodies, situated one above each kidney. They are covered by a proper membrane, and internally by the peritoneum. In a healthy state they have a small cavity in which there is a brownish fluid. No excretory duct has yet been detected, nor is their use known.

The pelvis is a cavity below the abdomen, and under the pubis, containing the urinary bladder, rectum, and organs of generation.

The vesica urinaria, or urinary bladder, is a membranous sac in the pelvis without the peritoneum, which in part gives it a coat of tunic. It is situated in men between the pubis and rectum, in women between the pubes and uterus, being fixed at its anterior and inferior part to the arch of the pubes by its neck and the urethra. It is divided into a fundus, which is loose in the abdomen, and, when the bladder is distended, reaches the navel and even the stomach, a neck before which the prostate gland is placed in men, and a body or that part composing the chief bulk of the bladder distinguished by an anterior and posterior part and sides. The anterior half of this distensible base is connected inferiorly in men to the rectum, and in women to the uterus its middle part to the bones of the pelvis by means of cellular membrane and muscular fibres, and its superior part is attached loosely to the muscles of the abdomen.

It is composed of three membranes like the intestines, a peritoneal, a muscular coat, and a vilous. Its use is to receive, retain, and expel the urine brought into it by the ureters, which perforate its inferior part near the neck of the bladder.

The male organs of generation are, the penis, testicles, and vesiculae seminales.

The penis, called also membrum virile, is that cylindrical part which hangs down under the mons Veneris, before the scrotum. It is divided into root, body, and head, called glans. The bony prominence which covers the pubes is called mons Veneris. The penis consists of common integument, two corpora cavernosa, the corpus spongiosum urethrae, and the urethra.

1st The corpora cavernosa, which form the chief bulk of the penis, are composed of a cellular and very elastic substance, and arise by two orura,

one from each ascending ramus of the ischium. At their origin they are firmly attached to the bone by a dense cellular membrane, they then converge towards the pubis, where they are also firmly connected to the symphysis by a dense cellular membrane. About this place they meet their elastic ligamentous substance together, and in consequence of several perforations in this ligamentum perinatium adurct, while there is a free communication between the cells of one corpus cavernosum and those of the other thus adhering together, they form the greater part of the penis, and end abruptly behind the corona glands. The corpora cavernosa, being each somewhat round, and lying together in the penis a considerable excavation is left above and below, in the former the great vein of the penis passes, and in the latter the corpus spongiosum urethrae.

2d The corpus spongiosum begins before the prostate gland, and surrounds the urethra. At its beginning it forms the bulbous part of the urethra, and then proceeds forwards in the space between the two corpora cavernosa on the under surface, and is expanded at the extremity of the penis into a very vascular substance, called glans penis, mutually covered by a fold of the skin, called the prepuce, which, at the under part of the glans, is fixed to it by a frenum.

3d The urethra is a membranous canal which proceeds from the bladder, through the prostate gland and the corpus spongiosum urethrae, and at the end of the glans penis its internal membrane is reflected over the glans, forming the meatus or opening, in the glans. The urethra is endowed with a high degree of sensibility and contractility.

In the urethra are to be observed,

1st The verumontanum, or caput gallinaginis, a cutaneous eminence in the urethra, about an inch before the neck of the bladder.

2d The openings of the ejaculatory ducts around the caput gallinaginis.

3d The opening of the ducts of the prostate and Cowper's glands.

4th The lacunae or openings of the ducts of the mucous glands of the urethra.

The lymphatics of this organ are deep-seated and superficial. The superficial arise from the prepuce in three divisions: one on the right side of the frenum, another on the left, and a third directly on the middle of the superior side. Those on the under side make a semicircular turn from the under to the upper side of the penis, whilst that on the superior side of the prepuce runs on the middle of the back of the penis, exactly in the direction of the symphysis pubis. At a little distance from the pubes the three divisions unite into one common trunk, which almost immediately separates again into two, one, going to the right groin, accompanying the veins going to the inguinal vein, and terminates near it in those inguinal glands which are nearest the symphysis pubis. The other trunk goes to the left groin, and terminates exactly in the same manner as the former. The deep-seated lymphatics accompany the arteries, and pass with them on the inside of the tuberosities of the ischia, or under the angle of the pubes. The use of the penis is for erection, coition, effusion of semen, and of urine.

The testes, or testicles, are two oval bodies, situated or usually within the cavity of the abdomen, from which they descend before birth, or soon after, into a bag, called the scrotum, placed under the root of the penis. The adult testicle is



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composed of arteries, veins, and a peculiar set of vessels, which arise from the minute termination of the arteries. This peculiar set of vessels are—

1 The vasa recta, which are found in the substance of the testicle, arising from the minute ramifications of the spermatic arteries. At the top of the testicle the straight vessels, which are the commencement of the excretory ducts, just as the biliary pores are of the ductus hepaticus, in-oscillate with one another, and form,

2 The rete vasculosum testis. This plexus of vessels sends off at the superior part of the testicle,

3 The vasa efferentia, which are ten or more in number. They pass from the body of the testicle, and soon uniting into one trunk, called vas deferens, form, by an immense number of convolutions, a somewhat hard substance, called the

Epididymis, which is pyramidal, has a thin convex head, and a flat thin extremity, it is formed merely of a convolution of the vas deferens, or excretory duct of the testicle.

The vas deferens is a long but small duct, formed of a cartilaginous substance, its cavity is not sufficiently large to admit a pin. It passes upwards from the end of the epididymis in a zig-zag manner by the side of the pubes, where it is no longer convoluted, but proceeds straight into the cavity of the pelvis to the vesiculae seminales.

The testicle has a strong, white, dense tunic, intimately connected to it, this is called the tunica albuginea testis. It completely encompasses the body of the testicle and is extended over the epididymis. It has also a tunic called vaginalis. Anatomists consider this as a production of the peritoneum, but the opinion does not appear to be well founded. It is a delicate membranous bag, connected externally by cellular structure to the dartos, and the testicle, with its tunica propria or albuginea, adheres firmly to its outside, pushing itself, as it were, into it, in the same way as the heart into the pericardium, the lungs into the pleura, &c. so that, when the tunica vaginalis is opened, the testicle is seen within it. The dartos is a condensation of cellular membrane lining the scrotum, with the cells of which it is closely connected. It admits of contraction and relaxation, and has generally but erroneously been described as a muscle. The scrotum consists of elastic cellular membrane and common integuments.

The vesiculae seminales are two whitish membranous receptacles, situated on the back part of the bladder, close to its neck, which are said to receive and contain the semen from the vasa deferentia, but the fluid does not appear to be the same as that secreted by the testes. Their substance is membranous, and resembles an intestine variously contorted, and covered with a fibrous substance. Each vesicula sends forth a duct, which passes through the prostate gland, and is called ejaculatory; they are some lines long, and enter the cavity of the urethra by a peculiar orifice at the top of the verumontanum.

The parts which serve for generation in women are divided into external and internal.

The external parts are—

1. The mons veneris. The prominent portion of integument immediately over the ossa pubis. It is formed by a quantity of fat under the skin, and, after puberty, is covered with short hairs.

2 The labia majora. Two external lips, of a soft consistence, and formed of very vascular common integuments. They arise from the sym-

physis pubis, are covered externally with hair, but their internal surface is smooth, and lubricated with the smegma of the odoriferous glands.

3 The clitoris. A small substance, placed just below the origin of, and within, the labia majora. It resembles a penis in miniature, and, like it, is formed of two spongy substances, which arise by two crura from the ascending ramus of the ischium. The clitoris is also, like the natural penis, covered with a foreskin. During erection, it is the principal seat of pleasure, and is extended and erected by the venereal stimulus.

4 The labia minora, or nymphæ. These are the two inner folds, placed at the commencement of the vagina, they begin from the foreskin of the clitoris, enlarging as they pass downwards, and terminate in the under part of the beginning of the vagina. Their structure is highly vascular and sensible, and they have a number of sebaceous glands to lubricate them. Their use appears to be, to assist in creating the venereal pleasure, and to direct the urine flowing against them out of the urethra, in such a manner as to prevent it from wetting the thighs.

5 The meatus urinarius. A small triangular opening, situated immediately under the clitoris, behind the nymphæ, and beset with mucous glands.

6 The hymen, seldom met with but in children, in whom it is mostly a semilunar membrane, situated at the entrance of the vagina, behind the meatus urinarius. When once lacerated it forms several fleshy excrescences, which are called carunculae myrtiformes.

The internal parts of generation are the vagina, uterus, Fallopian tubes, ovaria, broad and round ligaments of the uterus, and the urethra.

The vagina is an elastic membranous canal leading from the nymphæ upwards, under the arch of the pubes, between the bladder and rectum, and terminating at the neck of the uterus, which it embraces.

It is composed of three membranes.

1 An epidermis, which enters from without.

2 A white, thick, elastic membrane which, in the virgin vagina, forms an immense number of transverse rugæ, or folds.

3 A cellular coat, which is external, and connects it to neighbouring parts and on which an immense number of arteries are distributed.

Besides these coats the vagina has also, especially at its anterior part, a number of muscular fibres, which surround it like a sphincter. In the vagina we find

1 A number of lacunæ, which excrete vis mucus.

2 In virgins, the hymen, and where this has been once ruptured, the carunculae myrtiformes, or remains of the hymen.

3 The meatus urinarius, immediately under the symphysis pubis, behind the clitoris.

4 The vaginal portion of the uterus, or os uteri.

The vagina embraces the penis in coition, and, by its muscular fibres at its origin, and its elastic membranous substance, accommodates itself to the size of that organ. The catamenia pass from the uterus through the vagina, as does also the fetus in labour.

The uterus, or womb, is a spongy hollow receptacle, somewhat like a flattened pear, situated in the pelvis between the urinary bladder and rectum. It is divided into the vaginal portion, the neck, the body, the fundus, and its appendages.

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The vaginal portion is called the os uteri, and, from its resemblance to the mouth of a tench fish, os tinea; midwives usually term it os internum, giving the name of os externum to the orifice of the vagina. In virgins it is much less than in those who have borne children, it consists of two labia, and an opening between, which leads to the cavity of the uterus. In the internal surface of the os uteri are situated a number of folds, and occasionally several small vesicles, and a quantity of transparent gelatinous mucus.

The neck of the uterus is also hollow, and contains several plicæ or folds. In some uteri it is longer than in others; its cavity leads to the uterine body. Children and virgins have the uterus more flattened than others, it is somewhat of a triangular shape, having its appendages going from each superior angle, whilst the body gradually diminishes towards the os uteri. The cavity in the body of the uterus is also triangular; it commences at the os uteri, is nearly of the same diameter all along the neck of the uterus, and enlarges in the body. At each superior angle, the cavity of the uterus receives that of the Fallopian tube. The uterus is lined by a smooth vascular membrane, whose vessels secrete the menstrual blood. The portion of the uterus which hangs into the cavity of the pelvis is covered by the peritoneum, whilst the vaginal portion receives a tunic from the epidermis continued from the vagina. The body of the uterus is composed of peculiar fibres, blood vessels, absorbents, and nerves. These fibres do not appear in an unimpregnated uterus to be of the same nature as those of the impregnated uterus.

The appendages to the uterus are the round and broad ligaments, the Fallopian tubes, and the ovaries.

1 The round ligaments are two vascular ligaments, about the size of a goose quill, which arise one from each side of the uterus, near its fundus, and somewhat on its anterior surface, and proceed obliquely outwards and downwards to the ring of the external oblique muscle, which they pass through, and are lost in the fat about the labia majora.

2 The Fallopian tubes are also termed uterine tubes; they go one from each superior angle of the uterus directly across the pelvis, for the space of four inches, covered by the peritoneum, and terminate by a fringed body, the fimbria, which float in the cavity of the pelvis. The substance of the Fallopian tube is of a muscular nature, by which means it has a peristaltic motion. In the middle of the fimbriae is the opening of the tube, so that if air were blown into the cavity of the vagina, it would pass into the cavity of the uterus, then along the Fallopian tubes into the cavity of the abdomen.

3 The broad ligaments consist of a duplicature of the peritoneum passing over the tubes and ovaria, and going, in form of a broad expansion to the sides of the pelvis, so that the peritoneum of the upper and under surfaces of the uterus meeting at the sides, goes across the pelvis to its side, forming what is called the broad ligaments in this passage it envelopes the tubes, ovaria, and blood-vessels.

4 The ovaria are two oblong and rather flattened bodies, hanging in the duplicature of the peritoneum, at the sides of the uterus about two inches from it, and behind the broad ligaments. Under the peritoneal coat of the ovarium is its proper substance, which is subcartilaginous. An

adult virgin ovarium contains a number of highly vascular vesicles, filled with a transparent fluid, said to be ovula, and first accurately described by De Graaf. Besides these vesicles, there are occasionally two or more blackish spots called corpora lutea, they were supposed to be a certain criterion of the woman's having borne a child, but this is erroneous, for corpora lutea exist in virgins; nor is it certain that the vesicles are ovula. The uterus and its appendages are for the purposes of generation, and the perfection of the young.

The involucre of the viscera, or splanchnic organs, we may also divide into external and internal.

The internal consist of the membrana adiposa, cutis, and rete mucosum.

1 The membrana adiposa, cellinosa, or reticularis is composed of limine and fibrous texture, so arranged as to form cells and a web like structure. It is found in almost every part of the body; the extremities as well as the trunk, connecting part with part, which is well exemplified by the fact of butchers' blowing up their veal. It is extremely vascular, and in some parts it separates oil from the blood, in consequence of which it is rendered adipose.

2 The cutis, dermis, or true skin, is an elastic, sensible, extremely porous, and thick membrane, situated between the rete mucosum and adipose membrane, covering the whole body. It is composed of a fibrous, vascular, and nervous structure. Its external surface is covered by the rete mucosum, and immediately over it is the cuticle. It is here that a vast number of nervous fibrils, called papillæ, are every where projecting from its surface to constitute the organ of touch; these are of various forms, and are most exquisitely sensible on the lips, finger-ends, &c. The use of the skin is to cover the whole body, and afford a situation for the organs of touch, exhalation, and inhalation.

The rete mucosum, mucus Malpighianus, rete Malpighianum, corpus mucosum, corpus reticulare, is a mucous substance, said to be disposed in a net-like form, between the epidermis and cutis. The difference of colour in mankind depends on this substance in Europeans it is white, in Ethiopians, black, &c. There is great variety in the thickness and transparency of the rete mucosum, in the lips, mouth, over the glans penis, nymphæ, vagina, &c. it is transparent and very delicate. It is thickest in the scrotum.

The external involucre consist of the epidermis, unguis, pilæ.

1 The epidermis, cuticula, or scarf-skin, is a thin, insensible, pellucid membrane, which covers the whole external surface of the body. It is perforated by the hairs, inhaling and exhaling vessels. Its outer surface is dry and hoary, and marked with various lines in which perforations are evident. Its internal surface is moist and shaggy, and connected to the cutis by the rete mucosum, which lies between them and the vessels and the hairs.

The epidermis is often reduplicated, as in the interior parts of the nose, mouth, arms, vagina, urethra, &c. Its thickness varies in different parts, and its colour is naturally white.

The unguis, or nail, is a horny lamina, situated in the extremities of the fingers and toes. Their use is to defend the nervous papillæ from contusion.

The *pili*, or hairs, are thin, elastic, dry filaments, growing out of the skin. Their colour and situation is various as is also their names. On the head they are termed *capilli*, above the eyes supercilia; on the margin of the eyes, constituting the eye-lashes, *cilia*, in the nostrils vibrissæ, *pili auriculares* in the meatus auditorius, *mustix* on the upper lip, *barba* on the lower jaw. See *pilus* from X to XIX inclusive

**ANATOMY** (Comparative), Zoöatomy. The dissection of brutes, fishes, polypi, &c to illustrate, or compare them with, the structure and functions of the human body. See **COMPARATIVE ANATOMY**

**ANATRON** (*Natron*, Arab. The name of a lake in Egypt where it was first observed) Soda, natron, or mineral alkali

**ANATIOM**, an island among the New Hebrides, in the South Sea Lat 20 10 S Lon 170.9 E

**ANAUMACHION**, in antiquity, the refusing to serve in the fleet.

**ANAXAGORAS**, one of the most celebrated philosophers among the ancients. He was born at Clazomene in Ionia, about the 70th Olympiad. He was a disciple of Anaximenes, and he gave up his patrimony, to be more at leisure for the study of philosophy, giving lectures in that science at Athens. Being persecuted in this place, and at last banished from it, he opened a school at Lampsacum, where he was greatly honoured during his life, and still more after his death. Statues having been erected to his memory. It is said he made some predictions relative to the phenomena of nature, as earthquakes, &c. upon which he wrote some treatises. His principal tenets may be reduced to the following:—All things were in the beginning confusedly mixed together, without order and without motion. The principle of things is at the same time one and multiplex, which had the name of homœmeries, or singular particles, deprived of life. But there is besides this, from all eternity, another principle, an infinite and impalpable spirit, who gave motion to these particles; in virtue of which, such as are homogeneal united, and such as were heterogeneous separated according to their different kinds. All things being thus put into motion by the spirit, every thing being united to such as are united, there that had a circular motion, produced lighter bodies, the lighter particles being those that were heavier denser. The mass of the earth, being drawn together by the force of the air, took fire, and produced the elements, which the sun and moon were afterwards formed of.

**ANAXAGORAS**, a famous ancient philosopher, a native of Clazomene.

**ANAXAGORAS**, a philosopher of Athens, one of the first who introduced the study of nature, and the knowledge of the human mind. He was banished from Athens for his opinions on the immortality of the soul, and the nature of the human mind. He was a disciple of Anaximenes, and a teacher of Socrates. He was a student of the Academy, and the founder of the Peripatetic school.

tested the philosophy, and punished him in a stone mortar with iron hammers. He bore this with much resignation, and exclaimed, "Pound the body of Anaxagoras, for thou dost not pound his soul." Upon this, Nicocreon threatened to cut his tongue, and Anaxagoras cut it off with his teeth, and spat it out into the tyrant's face.

**ANAXIMANDER**, a philosopher of Miletus, the disciple and successor of Thales. He had a considerable knowledge of astronomy and geography, and was the first who noticed the obliquity of the ecliptic; he taught that the moon receives her light from the sun, and that the earth is globular to him is ascribed the invention of the sphere, the gnomon, and geographical charts. He likewise discovered that the obliquity of the ecliptic was measured by about 1-15th of a great circle, or nearly 24 degrees. He lived in the year 645 B.C.

**ANAXIMENES**, the pupil and successor of the above, maintained that air was the first principle of all things. Pliny says, that he invented the sun-dial. He flourished in the 4th century B.C.; so that Pliny's testimony must be erroneous, respecting the invention of sun-dials, that of Ahaz being in existence at least 700 years before the Christian era.

**ANBERTKEND**, in the eastern language, a celebrated book of the Brachmans, wherein the Indian philosophy and religion are contained. The word in its literal sense denotes the cistern wherein is the water of life. The Anbertkend is divided into fifty *betas* or discourses, each of which consists of ten chapters. It has been translated from the original Indian into Arabic, under the title of *Morat al Maani*, q d "the marrow of intelligence."

**ANCEPS CAULIS**, in botany, (an incipital stem) *Angulis duobus oppositis acutiusculis*. Two-edged or double-edged. Flatted, and rather sharp with two opposite angles. This is the common form of the aneipital stem, but it may have more angles than two; for Linneus gives not only digonus (caulis) but trigonus, tetragonus, pentagonus, and polygonus, as species of the aneips. There is also an aneipital leaf, having two prominent longitudinal angles, with a convex disk, as an *anepichium*.

**ANCESTORS**, progenitors, or those from whom a person is descended; exclusive of his immediate parents. The word is derived from the Latin *ancessor*, written, by contraction, for *antecessor*, q. d. *goer before*. Most nations have paid honours to their ancestors. It was properly the departed souls of their forefathers that the Romans worshipped under the denominations of *lares*, *penates*, and household gods. Hence the ancient tomb was a kind of temple, or rather altar, wherein oblations were made by the kindred of the deceased. The law distinguishing between ancestor and predecessor; the former being applied to a natural person, as such an one and his ancestor, and the latter to a body politic or corporation, as a bishop and his predecessors.

**ANCESTRAL**, (from *ancessor*) *Calced* from ancestors (*Calced*).

**ANCESTRY** *a.* (from *ancestor*) 1 Lineage; a series of ancestors (Pope). 2 The honour of descent; birth (Addison).

**ANCHENTRY** *a.* (from *ancient*) Antiquity of a family, property *anchentry* (Shak)

**ANCHILOPS** See **ANCHYROPS**.

**ANCHISES**, in fabulous history, was a Trojan prince, son of Cyprius. He was so agreeable in the eyes of Venus, that she offered herself to him in the form of a beautiful young woman, desiring him to present her to his relations, in order to have their marriage speedily solemnized; but he telling her, that nothing should prevent his enjoying her on the spot, she took him at his word. Venus told him that she should bear him a son, who should be called *Æneas*; but told him that if he ever boasted of the favour she had granted him, he would be thunder-struck by Jupiter. Some time after, when he was drinking with his friends, the secret escaped him, on which it is said that he was struck by thunder, and that this occasioned the loss of his sight.

**ANCHOR, ANCHORA**, an instrument at sea, and in rivers, to retain and fasten a vessel by. The word comes from the Latin *ancora*, or *anchora*, of the Greek *αγκυρα*, which comes from *αγκυλος*, *incurvus*, crooked.

The anchors now made are contrived so as to sink into the ground as soon as they reach it, and to hold a great strain before they can be loosened or dislodged from their station. They are composed of a shank, a stock, a ring, and two arms with their flukes. The stock, which is a long piece of timber fixed across the shank, serves to guide the flukes in a direction perpendicular to the surface of the ground, so that one of them sinks into it by its own weight as soon as it falls, and is still preserved steadily in that position by the stock, which, together with the shank, lies flat on the bottom. In this situation it must necessarily sustain a great effort before it can be dragged through the earth horizontally. Indeed this can only be effected by the violence of the wind or tide, or both of them, sometimes increased by the turbulence of the sea, and acting upon the ship so as to stretch the cable to its utmost tension, which accordingly may dislodge the anchor from its bed, especially if the ground be soft and oozy, or rocky. When the anchor is thus displaced, it is said, in the seaphrase, to come home.

Every ship ought to have three principal anchors, viz. the sheet, *makre-anore*, (which is the *anchora magna* of the ancients), the best bower, *second-anore*, and small bower, *third-anore*, so called from their relative situation on the ship's bows. There are besides smaller anchors, for securing a ship from place to place in a harbour or river, where there may not be much or wind for sailing; these are the *small bower*, *small anchor*, the *head* and *stern* anchors. The latter however, is called by the sailors the *head* and *stern* anchors. In England, France, and Holland, anchors are made of forged iron, or rather of a number

of small rods of very tough metal, but in Spain they are sometimes made of copper, and likewise in several parts of the South Sea. M. Bouguer, in his *Traité de Navire*, gives the following dimensions of the several parts of an anchor. The two arms generally form the arch of a circle, whose centre is three eighths of the shank from the vertex, or point where it is fixed to the shank; and each arm is equal to the same length, or the radius, so that the two arms together make an arch of 120 degrees. The flukes are half the length of the arms, and their breadth two-fifths of the said length. With respect to the thickness, the circumference at the throat, or vertex of the shank, is generally made about a fifth part of its length, and the small end two-thirds of the throat, the small end of the arms of the flukes, three-fourths of the circumference of the shank at the throat. These dimensions should be bigger when the iron is of a bad quality, especially if cast iron be used instead of forged iron.

An improvement in the construction of anchors has been proposed by Mr. James Stuard, of the parish of St. Anne, Middlesex, who obtained a patent for his invention, dated Feb. 9, 1796.

The whole of this invention consists in making the anchor with one fluke or arm instead of two, and contriving to load that fluke or arm in such a manner as to make it always fall the right way. With this view Mr. Stuard would have the shank of the anchor made very short, that it may sink the more when suspended by the cable, and he would have the arm and its fluke or head in one length, that there may be no shock or joining in the whole instrument. The bend of the shank and arm he would have rounded, and not angular as in the common anchor; and on this bend he would have a small shackle, or two plates with a small bolt between them, for the buoy-rope to be made fast to. Instead of wood, he proposes for the stock of the anchor a bar of wrought iron, loaded or covered at the ends with knobs of cast iron, and he would have the palm of the fluke or arm either to be composed entirely of cast iron, or to be a cast iron shell filled with lead. This weight of the palm, the shortness of the shank, and the situation of the stock, will no doubt make the anchor fall the right way; which, having but one fluke, will never be tripped by the cable along hold of it on the ship's swinging, nor will it prove so dangerous as the common anchor, which is liable as may happen to ground in such a manner as to pull the ship.

The anchor is said to be *down*, when the cable is perpendicular between the ship and the anchor. An anchor is said to be *up*, when it cannot hold the ship. An anchor is *hoist*, when by the turning of the cap, the cable is hatched about the fluke. To *set* an anchor, is to fit boards upon the flukes, that it may hold the bottom in soft ground. When the anchor hangs right up, and down by the shank, it is said to be *down*, upon the ship's coming to an anchor.

*Riding at Anchor*, is the state of a vessel moored and fixed by her anchors

*Dropping an Anchor*, imports the letting it down into the sea In some cases it is necessary to drop two anchors opposite to each other, one to keep the ship firm against the tide or flow, the other against the ebb

*Weighing Anchor*, is the recovering it into the vessel in order for sailing The anchor is ordinarily weighed by means of a windlass

**ANCHOR**, in architecture, is a sort of carving, somewhat resembling an anchor It is commonly placed as part of the enrichments of the boudins of capitals of the Tuscan, Doric, and Ionic orders.

**To ANCHOR**, *v n* (from the noun) 1 To cast anchor, to lie at anchor (*Pope*) 2 To stop at, to rest on (*Shaks*)

**ANCHORAGE**, *s* (from anchor) 1 The hold of the anchor (*Wotton*) 2 The set of anchors belonging to a ship (*Shaks*)

**ANCHORED**, *particip a* (from *To anchor*) Held by the anchor (*Waller*)

**ANCHORALIS PROCESSUS** (*anchoralis*, from *anchora*, the elbow) See **CORACOID PROCESS**

**ANCHOR-HOLD**, *s* (from anchor and hold) The hold or fastness of the anchor, and, figuratively, security (*Comden*)

**ANCHOR-SMITH**, *s* (from anchor and smith) The maker or forger of anchors

**ANCHOVY**, in ichthyology and commerce, a species of clupea, with the upper jaw longest (See **CLUPEA**) The anchovy is so like the common sprat, another species of clupea, that it is no wonder this fish is often pickled and sold under its name. The fishing for anchovies is carried on chiefly in the night-time, when a light being put on the stern of the vessels, the fishes flock round, and are caught in the nets

**ANCHOVY FRUIT**. This fruit, the produce of the gree caprifera of Linnæus, is eaten by the inhabitants of Samos, as a pleasant and refrigerant fruit See **SAMOS**

**ANCHUSA**, *Alkanet* (*anchusa*, *arxouca*, from *ancha*, to smother) From its supposed emollient quality; or, as others say, because it strangles serpents A genus of the class and order polypetala monogynia Corol funnel-form, the throat closed with arched valves,

opening out at the base It has thirteen stamens, of which is common to our own country, an officialis, or bugloss (*See* **BUGLOSS**) It is the a tinctoria, a bluish purple, whose root imparts the fine blue dye of the spirit of wine, oil, wax, and other substances

**ANCHYLOMERIS**, *s* (*anchylomeris*, from *anchylos*, to bend) A contraction or growing together of the bones

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**ANCIENT DEMESNE, or DEMAIN**, in law, is a tenure, whereby all manors belonging to the crown in William the Conqueror's and St Edward's time, were held

The numbers, names, &c hereof were entered by the Conqueror, in a book called Domesday Book, yet remaining in the Exchequer, so that such lands as in that book appeared to have belonged to the crown at that time are called ancient demesne

The tenants in ancient demesne are of two sorts, one who hold their lands frankly by charter the other by copy of court roll, or by the verge, at the will of the lord, according to the custom of the manor

The advantages of this tenure are, 1 That tenants holding by charter cannot be rightfully impleaded out of their manor, and, when they are, they may abate the writ, by pleading the tenure 2 They are free from toll for all things relating to their livelihood, and husbandry, nor can be impanelled on any inquest

**ANCIENT**, *s* 1 The flag of streamer of a ship 2 The bearer of a flag (*Shaks*)

**ANCIENTLY**, *ad* (from ancient) In old times (*Sidney*)

**ANCIENTNESS**, *s* (from ancient) Antiquity, existence from old times (*Dryden*)

**ANCIENTRY**, *s* (from ancient) The honour of ancient lineage (*Shaks*)

**ANCIENTS**, *s* Those that lived in old times opposed to the moderns (*Pope*)

**ANGISTRUM** In botany, a genus of the class and order diandria monogynia Calyx four-leaved, corolless, stigma many-parted, drupe dry, hispid, one-celled There are three species, all of which are exotics

**ANCIAM**, a strong town of Upper Saxony, in Germany, remarkable for the excellent pastures in its vicinity Lat 53 52 N Lon 14 5 E

**ANCON** (*ancon*, *αγκων*, from *αγκυραμα*, to embrace, and *αγκων*, from *αγκων*, because the bony meeting, and there uniting, are folded one into another) In anatomy, the elbow

**ANCONA**, a marquise and province in the pope's territories in Italy

**ANCONA**, the capital of the district of the same name, in Italy It is the Picenum of the ancients The inhabitants trade in white wax, which trade is mostly engrossed by the Jews of this place, who amount to about 5000 Lat 43 38 N Lon 13 35 E

**ANCONES**, in architecture, the corners or quoins of walls, cross-beams, or rafters Sometimes the word denotes corbels

**ANCONIUS** (*anconius*, *αγκωνιος*, from *αγκων*, the elbow) Anconius minor of Winslow

Anconius vel cubitans Rolani of Douglas. A small triangular muscle situated on the back part of the elbow It arises from the ridge and from the external condyle of the humerus by a thick, strong, and short tendon from the humerus becomes fleshy, and after running about three inches obliquely backwards, it is inserted by its oblique fleshy fibres into the



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back part or ridge of the puma Its use is to extend the fore arm.

**ANCONÆUS EXTERNUS.** See **TRICEPS EXTENSOR CUBITI**

**ANCONÆUS INTERNUS** See **TRICEPS EXTENSOR CUBITI**.

**ANCONÆUS MAJOR** See **TRICEPS EXTENSOR CUBITI**.

**ANCONÆUS MINOR** See **ANCONÆUS**, and **ANATOMY**.

**ANCONOID PROCESS** (*processus anconoides*, from *ανων*, the elbow) A process of the cubit. See **ULNA**.

**ANCYLE**, in antiquity, a shield that fell, as was pretended, from heaven, in the reign of Numa Pompilius, at which time, likewise, a voice was heard declaring that Rome should be mistress of the world as long as she should preserve this holy buckler.

**ANCYLOBLEPHARON** (*αγκυλοβλεφαρον*, from *αγκυλη*, a hook, and *βλεφαρον*, an eyelid) A disease of the eye, by which the eyelids are closed together.

**ANCYLOGLOSSUM** (*ancyloglossum*, *αγκυλογλωσσον*, from *αγκυλη*, a hook, and *γλωσσα*, the tongue) A contraction of the frænum of the tongue. Tongue-tidness.

**ANCYLOSIS** (*ancylosis*, *αγκυλωσις*, from *αγκυλος*, crooked) Anchylosis. A contraction of the joints impeding their motion.

**AND conj.** The particle by which sentences or terms are joined.

**ANDABATÆ**, in antiquity, gladiators who fought hoodwinked.

**ANDALUSIA**, a province of Spain, bounded on the south by the kingdom of Granada, on the west by Algarve and the sea, on the north by Estramadura, and on the east by the kingdom of Murcia. It is about 250 miles long, and 150 broad.

**ANDALUSIA** (New), a province of Terra Firma, in South America, whose boundaries cannot be well ascertained.

**ANDAMAN**, two islands so called in the gulf of Bengal, the Great and Little. The Great Andaman is about fifty leagues long and eight wide. The Little Andaman is about eight leagues in length, and five in breadth, the inhabitants are of a gentle harmless disposition, they eat no flesh, and employ themselves in cultivating their lands, and raise great plenty of rice and fruit, which they sell to European vessels, that pass that way. The Great Andaman lies in lon 93 40 to 93 15. E Greenwich, and lat 11 29 to 13 55 N. The Little Andaman lies about ten leagues S of the other.

**ANDANTE**, by the musicians of the present day, is used to imply a time somewhat slow, and a performance distinct and exact, gentle, tender, and soothing.

**ANDANTINO**, in music, gentle, tender, and somewhat slower than *andante*.

**ANDELY**, a town in the department of Eure, and late province of Normandy, in France. Lat. 49. 20 N. Lon. 1. 30 E.

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**ANDERQ** (St.), a sea-port town of Biscay, in Spain. Lat 43 25 N. Lon 4 30 W.

**ANDERSON** (Alexander), an eminent mathematician, was born at Aberdeen towards the end of the 16th century. Where he was educated, or under what masters, we have not learned, probably he studied the belles lettres and philosophy in the university of his native city, and, as was the practice in that age of all who could afford it, went afterwards abroad for the cultivation of other branches of science. But wherever he may have studied, his progress in science must have been rapid, for, early in the 17th century, we find him professor of mathematics in the university of Paris, where he published several ingenious works, and among others, 1. *Supplementum Apollonii Redivivi*, sive analysis problematis hactenus desiderati ad Apollonii Pergæi doctrinam *περι τινος τριου*, a Marino Ghetaldo Patriuo Ragusino hujusque, non ita pridem restitutam. In qua exhibetur mechanicæ æqualitatum tertii gradus sive solidarum, in quibus magnitudo omnino data, æquatur homogeneæ sub altero tantum coefficiente ignoto. Huic subnexa est variorum problematum practice, Paris, 1612, in 4to.—2. *Αισιολογια*. Pro Zetetico Apolloniani problematis a se jam pridem edito in supplemento Apollonui Redivivi. Ad clarissimum et ornatissimum virum Marinum Ghetaldum Patrium Ragusinum. In qua ad ea quæ obiter nullo perstrinxit Ghetaldus respondetur, et analytices clarior detegitur. Paris, 1615, in 4to.—3. *Francisci Vietæ Fontenacensis de Æquationum Recognitione et Emendatione Tractatus dyo*, with a dedication, preface, and appendix, by himself. Paris, 1615, in 4to.—4. *Vietæ Angulari Sectiones*, to which he added demonstrations of his own. Our professor was cousin-german to Mr. David Anderson of Finsburgh, a gentleman who also possessed a singular turn for mathematical knowledge. This mathematical genius was hereditary in the family of the Andersons, and from them it seems to have been transmitted to their descendants of the name of Gregory, who have for so many generations been eminent in Scotland as professors either of mathematics, or, more lately, of the theory and practice of physics.

**ANDERSON** (George), an English mathematician, was born at Wepton, in Buckinghamshire, in 1760. His parents were common peasants, and he was obliged to work as a day-labourer. His genius, however, overcame every difficulty, and he acquired by himself a knowledge of the higher branches of the mathematics. His extraordinary accomplishments and modesty recommended him to a worthy clergyman, who at his own expense sent him to a grammar-school, and thence to New College, Oxford, where he took the degree of M. A. He also entered into deacon's orders, but having no relish for a country curacy, he set out for London, and after waiting some months, obtained a place as clerk to the board of con-

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trout, under Mr. Dundass. He attended with such assiduity to business, as to lay the foundation of a disorder which carried him off, April 30, 1796. He left a widow, who, in consideration of her husband's merits, obtained a pension. Mr. Anderson published *Arenarius*, or a Treatise on Measuring the Sands, translated from the Greek of Archimedes, and a General View of the Variations which have taken place in the Affairs of the East-India Company, since the Conclusion of the War in India, in 1784. One of Mr. Anderson's earliest friends was Mr. Bonnycastle, of the Royal Military Academy, who always speaks of his talents and disposition in terms of the highest respect.

**ANDES**, or **CORDILLERAS**, a great chain of mountains, which run almost the whole length of South America. They are the highest and most remarkable mountains in the world, for those within the torrid zone are always covered with snow; and in passing over the lower part of them, people are in danger of being starved with cold. There are a great many volcanoes, which break out sometimes in one place, and sometimes in another, and by melting the snow, occasion such a torrent of water, that numbers of men and cattle have perished.

**ANDES**, a hamlet of Mantua, in Italy, the birth-place of Virgil.

**ANDIRON**, a The Iron at the end of a fire-grate in which the spit turns.

**ANDOVER**, a borough in Hampshire, with a market on Saturday. It sends two members to parliament. Lat. 51. 14 N. Lon. 1. 20 W.

**ANDRACHNE**, *Rhynchon orpita*. A genus of the class and order *Scorpionaria*. *Gynandria*. Male calyx five-leaved, corolla five-petalled; stamens five, on the filament of a style. Female calyx five-leaved, corolla five-petalled; styles three; capsule three-celled, seeds in pairs. There are three exotic species, Italy, India, Cambricacy, furnishing one each.

**ANDRACHNE**, *Drachma*. See **ARBUS**.

**ANDRACHNE**, in Botany, a genus of the class and order *Chrysogamia musci*. Capsule very short, minutely fringed simple, of four incised, serrate teeth, united at their tips, and forming a lid and veil. There are two

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**ANDREW**, in the

**ANDREW**, in the

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that Andrew was the *St. Andrew* of Christ. He is said to have preached the gospel in Scythia, and to have been crucified on a cross shaped like the letter X, but his being thus crucified has not, as we find, any foundation in ancient records.

**ANDREWS** (*Lawyer*), an English divine, was the son of a minister, and was master of the Trinity House; and was born in London, in 1565. He was educated first at the Coopers' free-school at Radcliffe, from whence he was removed to Merchant Taylors' school, and was sent on an exhibition to Pembroke-hall, Cambridge; where having taken his degrees in arts, he applied himself to divinity. Sir Francis Walsingham obtained for him the living of St. Giles, Cripplegate, and afterwards a prebend and residentiaryship of St. Paul's. On the death of Mr. Fulke he was chosen master of Pembroke-hall, to which he was a great benefactor. He was also appointed one of the chaplains to queen Elizabeth, who greatly admired his preaching. King James I. employed him to defend the sovereignty of kings against Bellarmine, who had lately attacked it under the name of Matthew Tortus. Dr. Andrews did this with much spirit, in a piece called *Tortura Torti*, &c. for which the king gave him the bishopric of Chichester in 1603, at the same time making him his almoner. In 1603 he was translated to Ely, and appointed one of the privy council for England, and also for Scotland. Nine years afterwards he was removed to Winchester, and made dean of the king's chapel. The following anecdote of bishop Andrews will shew him to great advantage. Waller the poet was one day at court, while king James was at dinner, who was attended by the bishop of Winchester; and Neale, bishop of Durham. His majesty said to the prelates, "My lords, cannot I take my subjects' money when I want it, without all this formality in parliament?" Bishop Neale quickly replied, "God forbid, sir, but you should, you are the breath of our nostrils." On which the king said to the bishop of Winchester, "Well, my lord, and what say you?" "Sir," replied Andrews, "I have no skill to judge of parliamentary cases." The king answered, "No puts off, my lord, answer me presently." "Then sir," said he, "I think it lawful for you to take my brother Neale's money, for he offers it." He died in 1626, and was buried in the church of St. Saviour's, Southwark, where there is a monument to his memory. He had a share in the present translation of the Bible. A volume of his sermons was printed after his death, by bishops Laud and Ducketridge. His private devotions and meditations in Greek were translated into English by Dr. Sushope. (Par-

his, in ancient writers, Hence also more particularly men or children in the Thea- the readers in

**ANDREW** (S.), a town of Fife in Scotland, once the metropolis of the Pictish kingdom, lying in 56. for 2. 30. N. 10. 15. W. St. Andrew's was formerly the seat of a



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archbishop. It is seated at the bottom of a bay, on the level top of a small hill, extending east and west, having an open prospect of the German Ocean. The university, which was founded by bishop Wardlaw, in 1411, once consisted of three colleges. It is governed by a chancellor, who is elected by the two principals, and the professors of both the colleges. The rector is the officer to whose superintendence are committed the privileges, discipline, and statutes of the university. Each college has a principal; that of St. Salvador has nine professors, and the new college has five professors. The commerce of St. Andrews is very inconsiderable.

**ANDRIA**, in Grecian antiquity, public entertainments, first instituted by Minos of Crete, and, after his example, appointed by Lycurgus at Sparta, at which a whole city or tribe assisted.

**ANDROGYNAL**, *a* (from *andros* and *gyn.*) Hermaphroditical, having two sexes

**ANDROGYNALLY** *ad* (from *androgynal*) With two sexes (*Brown*).

**ANDROGYNUS** *s* (See **ANDROGYNAL**) A hermaphrodite

**ANDROGYNOUS**, among astrologers, is applied to such of the planets as are sometimes hot and sometimes cold as Mercury is reckoned androgynous, being hot and dry when near the Sun, cold and moist when near the Moon

**ANDROGYNOUS PLANT**, (*planta androgyna*, from *andros* and *gyn.*) A plant bearing male and female flowers, on the same root, without any mixture of hermaphrodites. Such plants are to be found chiefly in the class monœcia

**ANDROGYNOUS FLOWERS**, flowers having stamens or pistils only

**ANDROIDES**, (from *andros*, *andros*, man, and *oides*, *form*) A human figure, which, by certain springs, or other movements, is capable of performing some of the natural motions of a living animal. The motions of the human body are more complicated, and consequently more difficult to be imitated, than those of any other creature, whence the construction of an androides, in such a manner as to imitate any of these actions with tolerable exactness, is justly supposed to indicate a greater skill in mechanics than any other piece of workmanship whatever.

A very remarkable figure of this kind appeared in Paris in the year 1738. It represented a flute-player, and was capable of performing many different pieces of music on the German flute, which, considering the difficulty of blowing that instrument, the different contractions of the lips necessary to produce the distinctions between the high and low notes, and the complicated motions of the fingers, must appear truly wonderful.—This machine was the invention of M. Vaucanson, member of the Royal Academy of Sciences, and a particular description of it was published in the Memoirs of the Academy for that year

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The figure, which was about five feet and a half high, was placed upon a square pedestal four feet and a half high, and three and a half broad. The air entered the body by three separate pipes, into which it was conveyed by nine pairs of bellows, which expanded and contracted, in regular succession, by means of a steel axis turned by clock-work. These bellows performed their functions without any noise, which might have discovered the means of conveying the air to the machine. The three tubes that received the air from the bellows passed into three small reservoirs in the trunk of the figure, where they waited, and, ascending towards the throat, formed the cavity of the mouth, which terminated in two small lips, adapted in some measure to perform their functions. Within this cavity was a small moveable tongue, which, by its motion at proper intervals, admitted the air, or intercepted it in its passage to the flute. The fingers, lips, and tongue derived their appropriate movements from a steel cylinder turned by clock-work. It was divided into fifteen equal parts, which, by means of pegs pressing upon the ends of fifteen different levers, caused the other extremities to ascend. Seven of these levers directed the fingers, having wires and chains fixed to their ascending extremities, which, being attached to the fingers, caused them to ascend in proportion as the other extremity was pressed down by the motion of the cylinder, and *vice versa*: thus the ascent or descent of one end of a lever, produced a similar ascent or descent in the corresponding fingers, by which one of the holes of the flute was occasionally opened or stopped, as it might have been by a living performer. Three of the levers served to regulate the ingress of the air, being so contrived as to open and shut, by means of valves, the three reservoirs above-mentioned, so that more or less strength might be given, and a higher or lower note produced. The lips were, by a similar mechanism, directed by four levers, one of which opened them to give the air a freer passage, the other contracted them, the third drew them back, and the fourth pushed them forward. The teeth were projected upon that part of the flute which receives the air, and, by the different motions already mentioned, properly modified the tune. The remaining lever was employed in the direction of the tongue, which it easily moved, so as to shut or open the mouth of the flute. The just succession of the several motions performed by the various parts of the machine was regulated by the following contrivances.—The extremity of the axis of the cylinder terminated in a screw, which, by an endless screw, consisting of a series of wheels, each placed at the distance of an inch from the other, from the other. Above this screw was fixed a piece of wax, which, by the pressure of the screw, obliged the wax to follow the threads, and, hence, if a lever

was moved, by a peg placed on the cylinder, in any one revolution, it could not be moved by the same peg in the succeeding revolution, because the peg would be moved an eighth of an inch beyond it by the lateral motion of the cylinder. Thus, by an artificial disposition of these pegs in different parts of the cylinder, the statue was made by the successive elevation of the proper levers to exhibit all the different motions of a flute-player. For a more minute account, see the article *Androïde* in *Nouveau Dictionnaire de Physique par Libes*, or, the *Mém. Paris Acad.* for 1738.

But if the construction of machines capable of imitating even the mechanical actions of the human body, shew exquisite skill, what shall we say of one capable, not only of imitating actions of this kind, but of acting as external circumstances require, as though it were endowed with life and reason? This, nevertheless, has been done. M de Kempelen, a gentleman of Presburg in Hungary, excited by the performances of M de Vaucanson, at first endeavoured to imitate them, and at last far excelled them. This gentleman constructed an *androïde* capable of playing at chess!—Every one who is in the least acquainted with this game must know, that it is so far from being mechanically performed, as to require a greater exertion of the judgment and rational faculties than is sufficient to accomplish many matters of greater importance. An attempt, therefore, to make a wooden chess-player must appear as ridiculous as to make a wooden preacher or counsellor of state. That this machine really was made, however, the public have had ocular demonstration. The inventor came over to Britain in 1783, where he remained above a year with his automaton.

It is a figure as large as life, in a Turkish dress, sitting behind a table, with doors of three feet and a half in length, two in depth, and two and a half in height. The chair on which it sits is fixed to the table, which runs on four wheels. The automaton leans its right arm on the table, and in its left hand holds a pipe. With this hand it plays after the pipe is removed. A chess board of eighteen inches is fixed before it. This table, or rather cupboard, contains wheels, levers, cylinders, and other pieces of mechanism, all which are publicly displayed. The vestments of the automaton are then lifted over its head, and the body is seen full of similar wheels and levers. There is a little door in its thigh, which is likewise opened, and with this, and the table also open, and the automaton uncovered, the whole is wheeled out of the room. The doors are then shut, and the automaton is ready to play, and it always makes the first move.

At every motion the wheels are heard, the image moves its hand, and looks over every part of the chess-board. When it checks the queen, it shakes its head twice, and thrice in going check to the king. It likewise shakes its head when a false move is made, replaces

the piece, and makes its own move; by which means the adversary loses one. M de Kempelen remarks as the most surprising circumstance attending his automaton, that it had been exhibited at Presburgh, Vienna, Paris, and London; to thousands, many of whom were mathematicians and chess-players, and yet the secret by which he governed the motion of its arm was never discovered. He prided himself solely on the construction of the mechanical powers, by which the arm could perform ten or twelve moves. It then required to be wound up like a watch, after which it was capable of continuing the same number of motions.

The automaton could not play unless M de Kempelen or his substitute was near it to direct its moves. A small square box, during the game, was frequently consulted by the exhibitor, and herein consisted the secret, which he said he could in a moment communicate. The secret was indeed simple, as our readers will find by referring to the article *AUTOMATON*, where it is disclosed.

**ANDROLEPSY**, in antiquity, a term something similar in meaning to our word reprisals. Thus, when one who committed a murder had escaped, the relations of the deceased were empowered to seize three men in the city or house whither the murderer had fled, either till he were surrendered, or satisfaction made for the murder.

**ANDROMEDA**, in astronomy, a constellation of the northern hemisphere, between Cassiopeia and Pegasus. It represents the figure of a woman chained. The number of stars generally reckoned in this constellation ranged according to their magnitudes, from 1st to 6th, are 0 3 2 10 16 35, in all 66.

**ANDROMEDA**, the name of a celebrated tragedy of Euripides, highly admired by the ancients, but now lost.

**ANDROMEDA** Marsh cistus a genus of the class and order decandria monogynia. Calyx five-parted, corol ovate, with a five cleft mouth, capsule superior, five celled, the partitions from the middle of the valves, anthers with two pores. There are twenty-six species, some natives of cold and others of warm climates. The greater part appertain to Siberia and North America. See *Nat Hist* pl V.

**ANDRON**, among the Greeks, an apartment designed for the use of men.

**ANDRONA** in ancient writings, has various meanings. 1 A space between two houses. 2 A passage between two apartments. 3 A public street. 4 That part in churches assigned to the men.

**ANDROPHAGI**, man-eater. See *ANTHROPOPHAGI*.

**ANDROPOGON** In botany, a genus of the class and order polygama monoscia. Heilm., calyx, glume two-valved, one-flowered, corol, glume awned at the base, stamens three, styles two, seed one, coated. Male corol awnless, stamens three. There are thirty-two species, all of which are exotics, and

the greater number natives of India. The two following are worth noticing.

*A schistanthus* of Arabian growth, well known by the name of camels' hay. *A nardus* Nard, or spikenard an Indian plant, highly celebrated in ancient and modern times for its perfume.

**ANDROS**, one of the ancient Cyclades, lying between Tenedos and Eubora. The ancients gave it various names, viz *Cauros*, *Lasia*, *Nonagria*, *Epagrus*, *Antandros*, and *Hydrusia*. *F* lon 25 30 N lat. 37 50

**ANDROSA'CE** In botany, a genus of the class and order pentandria monogynia Umbel with a many-leaved involucre; corol with an ovate tube, and glandular throat, capsule one-celled, globular. Ten species, nearly the whole of which are natives of Europe, and chiefly of the Alps none are known to be indigenous to our own country.

**ANDRY'ALA** Downy sow-thistle a genus of the class and order syngenesia polygamia equal. Receptacle villous, calyx many parted, nearly equal, rounded, down simple, sessile. Six species, all natives of the south of Europe or the Barbary coast.

**ANICDOTÆ, ANECDOTA**, a term used by some authors for the titles of secret histories, but it more properly denotes a relation of detached and interesting particulars. The word is Greek, *avendota*, q d things not yet known or hitherto kept secret. Procopius gives this title to a book which he published against Justinian and his wife Theodora, and he seems to be the only person among the ancients who has represented princes such as they are in their domestic relation.—Virrillus has published *Anecdotes of the House of Medici*.

**ANFMO-CHORD**, a name given to the Æolian harp.

**ANEMOMETER** *s* (*ανημο*, and *μετρον*) An instrument to measure the force and velocity of the wind. The first instrument of this kind was, we believe, invented by Wolfius in 1708, and described in his *Aerometry*. Various machines for the same purpose have been invented by different persons. Descriptions of some of them may be seen in *Mem Acad Scienc an 1734*. Hutton's Translation of Ozanam's *Recreations*, vol. II. Watson's *Trans of Euler on the Theory of Vessels*, p. 161. Gregory's *Mechanics*, vol. II. p. 48. and different parts of the *Phil Transac*. We shall describe two of the best. The first is Mr. B. Martin's improvement upon the anemometer of Wolfius. (See pl 10 fig 4.) An open frame of wood ABCDEFGHI, is supported by the shaft or arbor I. In the two cross-pieces II K, L M, is moved a horizontal axis Q M, by means of the four sails, *ah*, *cm*, *of*, *gh*, exposed to the wind in a proper manner. Upon this axis is fixed a cone of wood, MNO, upon which, as the sails move round, a weight R, or S, is raised by a string round its superficies, proceeding from the smaller to the larger end N O. Upon this larger end or base of the

cone, is fixed a ratchet-wheel *k*, in whose teeth the click X falls, to prevent any retrograde motion from the depending weight.

The structure of this machine sufficiently shews that it may be accommodated to estimate the variable force of the wind, because the force of the weight will continually increase as the string advances on the conical surface, by acting at a greater distance from the axis of motion, consequently, if such a weight be added on the smaller part M, as will just keep the machine in equilibrio in the weakest wind, the weight to be raised, as the wind becomes stronger, will be increased in proportion, and the diameter of the cone N O may be so large in comparison to that of the smaller end at M, that the strongest wind shall but just raise the weight at the greater end.

If, for example, the diameter of the axis be to that of the base of the cone N O as 1 to 28, then, if *S* be a weight of one pound at M on the axis, it will be equivalent to 28 pounds when raised to the greater end. If, therefore, when the wind is weakest, it supports one pound on the axis, it must be 28 times as strong to raise the weight to the base of the cone. If therefore a line or scale of 28 equal parts be drawn on the side of the cone, the strength of the wind will be indicated by that number on which the string rests.

In the *Philos. Transactions* for the year 1775, Dr Lind gives a description of a very ingenious portable wind-gage, by which the force of the wind is easily measured, a brief description of the principal parts of which here follow. This simple instrument consists of two glass tubes, A B, C D, (pl 10 fig 5) which should not be less than eight or nine inches long, the bore of each being about  $\frac{1}{8}$  of an inch diameter, and connected together by a small bent glass tube *eh*, only of about  $\frac{1}{8}$  of an inch diameter, to check the undulations of the water caused by a sudden gust of wind. On the upper end of the leg A B is fitted a thin metal tube, which is bent perpendicularly outwards, and having its mouth open to receive the wind blowing horizontally into it. The two tubes, or rather the two branches of the tube, are connected to a steel spindle K L by slips of brass near the top and bottom, by the sockets of which at *e* and *f* the whole instrument turns easily about the spindle, which is fixed into a block by a screw in its bottom, by the wind blowing in, at the orifice at B. When the instrument is used, a quantity of water is poured in, till the tubes are about half full, then exposing the instrument to the wind, by blowing in at the orifice F, it forces the water down lower in the tube A B, and raises it so much higher in the other tube, and the distance between the surfaces of the water in the two tubes, estimated by a scale of inches and parts H I, placed by the sides of the tubes, will be the height of a column of water whose weight is equal to the force or momentum of the wind blowing or striking against an equal base. And as a cubic foot of water

weighs 1000 ounces, or 62½ pounds, the twelfth part of which is 8½, or 8½ pounds nearly, therefore for every inch the surface of the water is raised, the force of the wind will be equal to so many times 8½ pounds on a square foot. Thus, suppose the water stand three inches higher in the one tube, than in the other; then three times 8½ or 1½ pounds is equal to the pressure or force of the wind on the surface of a foot square

This instrument of Dr Land's measures only the force or momentum of the wind, but not its velocity. However the velocity of the wind may be deduced from its force so obtained, by help of some experiments performed by Dr Hutton at the Royal Military Academy, in the years 1786, 1787, and 1788; from which experiments it appears that a plane surface of a square foot suffers a resistance of twelve ounces from the wind, when blowing with a velocity of twenty feet per second, and that the force is nearly as the square of the velocity. Hence then, taking the force of 15½ pounds, above found, for the force of the wind when it sustains three inches of water, and taking the square roots of the forces, it will be as  $\sqrt{4} \sqrt{15\frac{1}{2}}$  20 9½ the fourth proportional, that is, a velocity of 9½ feet per second, or 62 miles per hour, is the rate or velocity at which the wind blows, when it raises the water three inches higher in the one tube than the other. And further, as the said height is as the force, and the force as the square of the velocity, we shall have the force and velocity, corresponding to several heights of the water in the one tube above that in the other, as in the following table.

*Falls of the corresponding Height of Water, Force on a Square Foot, and Velocity of Wind*

Height of Water	Force of Wind	Velocity of Wind per Hour
Inches	Pounds	Miles
0½	1½	18 0
0½	2 0	25 6
1	5 2	30 0
2	10 4	50 8
3	15 6	62 0
4	20 8	76 0
5	26 0	80 4
6	31 25	88 0
7	36 8	95 2
8	41 7	101 6
9	46 0	108 0
10	51 1	113 0
11	56 1	119 2
12	61 2	124 0

In one instance Dr Land found that the force of the wind was equal to be equal 34½ pound, on a square foot, and this by proportion, in the foregoing table, will be found to answer to a velocity of 62 miles per hour, a velocity which, since Dr Corradi's celebrated

aerial voyage to Colchester, must be reckoned within the bounds of probability

**ANEMONE.** Wind-flower; a genus of the class and order polyandria polygynia Calyxless; petals from five to nine seeds numerous. There are twenty-seven species, all among the highest ornaments of our gardens about four of them, in their simplest state, are natives of our own country; the rest derive their birth from warmer climates. The hepaticas, pulsatillas, or pasque-flowers, and anemoides, are all included in the present arrangement of this genus. Several of the species are used medicinally, especially a hepatica under the pharmaceutic name of *HEPATICA NOBILIS*, which see, a nemorosa under that of *RAMANSCULUS ALBUS*, which see, and a pratensis under that of *PULSATILLA NIGRICANS*, which see.

**ANEMONOIDES** See **ANEMONE**

**ANEMOSPIRMOS** In botany See **GORTERIA**

**ANEMOSCOPE**, is sometimes used to denote a machine invented to foretell the changes of the wind, or weather, and sometimes for an instrument shewing by an index what the present direction of the wind is. Of this latter sort, it seems, was that used by the ancients, and described by Vitruvius, and we have many of them at present in large or public buildings, where an index within a room or hall points to the name of the quarter from whence the wind blows without, which is simply effected by connecting an index to the lower end of the spindle of a weather-cock.

The term anemoscope has likewise been used by Stone and others, to denote what is now commonly called an hygrometer.

**ANENCEPHALOUS** (*ανκεφαλος*, from *α priv* and *κεφαλος*, the brain) Brainless born without brain.

**ANENG** *priv* (Scotch dialect) 1 Concerning, about 2 Over against, opposite to **ANPI THYMIA** (from a *priv* and *επιθυμια*, desire) Loss of appetite.

**ANES** *s* The spires or beards of corn.

**ANESIS** (from *ανισμι*, to relax) A remission or relaxation of a disease or symptom.

**ANET** The herb dill. See **ANETHUM**, of which it is a contraction.

**ANETHUM** Dill a genus of the class and order pentandria digynia. Fruit ovate, somewhat compressed, striate, petals imbricate, entire. There are three species 1. a. graveolens, 2. a. segetum, both natives of Spain and Portugal 3. a. feniculum, or fennel, a native of our own cliffs.

The seeds of the a. graveolens, which is also found by cultivation in England, are directed for use by the London and Edinburgh pharmacopoeias: they have a moderately warm, pungent taste, and an aromatic, but sickly smell. There is an essential oil, and a distilled water, prepared from them, which are given in flatulent colics and dyspepsia. They are also said to urinate the secretion of milk.

**ANEURISM.** (*ανευρισμα*, *ανευρισμα*, from

*aneurysm, to dilate*) A preternatural dilatation of an artery. A genus of diseases ranked by Cullen in the class local, and order tumores. There are three species of aneurysm. 1 The true aneurysm, *aneurysma verum*, which answers to the above definition, and is known by the presence of a pulsating tumour. 2 The spurious aneurysm, *aneurysma spurium*, which is a collection of blood in the cellular membrane from a ruptured artery. 3 The varicose aneurysm, *aneurysma varicosum* which was first described by Dr W. Hunter. It occurs when the brachial artery is punctured in opening a vein: the blood then rushes into the vein, which becomes varicose. Aneurysms may happen in any part of the body, except the latter species, which can only take place where a vein runs over an artery.

**ANEURISMA SPURIUM** See ANEURISM

**ANEURISMA VARICOSUM** See ANEURISM

**ANEURISMA VERUM** See ANEURISM

**ANE'W** *ad* (from *a* and *new*) 1 Over again, another time (*Prior*) 2 Newly, in a new manner (*Rogers*)

**ANFRACTUOUS** *a* (*anfractus*, Latin) Winding, mazy, full of turnings and winding passages (*Ray*)

**ANFRACTUOUSNESS** *s* (from *anfractus*) Fullness of windings and turnings

**ANGARI**, in antiquity, public couriers appointed to carry messages. By the Persians these were called *astandæ*, by the Greeks

*αγγελοδρομοί*

**ANGARIA**, in Roman antiquity, a kind of public service, imposed on the provincials, which consisted in providing horses and carriages for the conveyance of military stores, and other public burdens

**ANGEIOTOMY** (*angiotomia*, *αγγειοτομία*, from *αγγιον*, a vessel, and *τομή*, to cut) The dissection of the blood-vessels of an animal body, also the opening of a vein or an artery

**ANGEIOTOMIST** (from *angiotomy*) A person skilled in the course of the vessels, or who can accurately dissect them

**ANGEL**, a spiritual intelligent substance, the first in rank and dignity among created beings. The word angel is Greek, and signifies a messenger, the Hebrew *מלאך* signifies the same thing. The angels are in Daniel (chap iv ver 13, &c.) called *עשר*, or watchers, from their vigilance for the same reason they are, in the remains we have of the prophecy attributed to Enoch, named Egregori, which word imports the same in Greek—Angels, therefore, in the proper signification of the word, do not impart the nature of any being, but only the office to which they are appointed, especially by way of message or intercourse between God and his creatures, in which sense they are called the ministers of God, who do his pleasure, and ministering spirits sent forth to minister for them who shall be heirs of salvation. That there are such beings as we call angels, that is, certain permanent sub-

stances, invisible, and imperceptible to our senses, endowed with understanding and power superior to that of human nature, created by God, and subject to him as the Supreme Being; ministering to his divine providence in the government of the world by his appointment, and more especially attending the affairs of mankind, is a truth so fully attested by Scripture, that it cannot be doubted. Nay, the existence of such invisible beings was generally acknowledged by the ancient heathens, though under different appellations: the Greeks called them *dæmons*, and the Romans *genii*, or *lares*. Epicurus admitted their existence, but denied their exercising any control over other existences (See Good's Life of Lucretius). The belief however of middle intelligences influencing the affairs of the world, and serving as ministers or interpreters between God and man, is almost as extensive as the belief of a God, having seldom, so far as we know, been called in question by those who had any religion at all.

**ANGEL** is likewise a title given to bishops of several churches. In this sense is St Paul understood by some authors, where he says, Women ought to be covered in the church, because of the angels. The bishops of the seven churches of Asia were, by a name borrowed from the synagogue, called the angels of those churches.

**ANGEL**, in commerce, the name of a gold-coin formerly current in England. It had different values in different reigns: it is now a mere nominal money, implying ten shillings. Its half was called angelot or angelot.

**ANGEL-FISH.** See *SQUALUS*

**ANGELIC, ANGELICAL** 1 Resembling angels. 2 Partaking of the nature of angels. 3 Belonging to angels.

**ANGELIC GARMENT**, *Angelica vestis*, among our ancestors, was a monkish garment, which laymen put on a little before their death, that they might have the benefit of the prayers of the monks. It was from them called angelical, because they were called angels who by these prayers anime salutem accurrebant.

**ANGE/LICA** (so called from its supposed angelic virtues) In botany, a genus of the class and order pentandria dygynia. Fruit roundish, solid, with three wings each side, calyx five-toothed, corols uniform, petals incurved, styles reflected. Six species, found in Europe and America; of which two, a *angelica*, garden angelica, and a *sylvestris*, wild angelica, are common to our own meadows or meadows. The roots of the first have a fragrant, agreeable smell, and a bitterish, pungent taste. The stalk, leaves, and seeds which are also directed in the pharmacopœias, possess the same qualities, though in an inferior degree. Their virtues are aromatic and carminative. A sweetmeat is made by the confectioners of this root, which is extremely agreeable to the stomach, and is surpassed only by that of ginger. Rectified spirit extracts



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the whole of the virtues of the plant, water but very little, excepting in distillation, during which a small portion of very pungent essential oil is obtained. The second species indigenous to our own country, or a sylvestris, possesses similar properties to the garden species, but in a much inferior degree. It is only used when the latter cannot be obtained. The seeds, powdered and put into the hair, kill lice.

**ANGELICA TREE** See **ARALIA**

**ANGELICALNESS** *s* Excellence more than human

**ANGELICI**, an ancient order of knights, instituted in 1191, by Isaacus Angelus Flavius Comnenus, emperor of Constantinople. They were divided into three classes, but all under direction of one grand master. The first were called torquati, from a collar which they wore, and these were fifty in number. The second were called the knights of justice, and were ecclesiastics. And the third were called knights servants.

**ANGELINÆ CORTEX** The tree from which this bark is procured is a native of Grenada. It has been recommended as an anthelmintic for children.

**ANGELITE**, Angelites, in ecclesiastical history, certain Christians, thus denominated from Angelum, the name of a place in Alexandria, where their first assemblies were held. They made their first appearance in the time of the emperor Anastasius, and pope Symmachus, about the year of Christ 494. The distinguishing tenets of the Angelites were, that the several persons of the Trinity had no distinct essence, substance, or deity, but only a subsistence or deity in common, or indivisible among them.

**ANGELO BUONAROTI** (Michael), a famous artist, was born in 1474, at the castle of Chiusi, in the territory of Arezzo, in Tuscany. Shewing an early inclination for designing, he was put under Dominico Ghirlandajo, under whom he made a very rapid progress. Having finished his studies, he was taken under the patronage of Lorenzo de Medici, but when the troubles broke out at Florence, he removed to Bologna. Angelo made an exquisite statue of Cupid, which he carried to Rome, and having broke off one of the arms, buried it in a place that was soon to be dug up. The statue being found, was sold to a cardinal for a fine antique, but our artist discovered the fallacy, by shewing the arm which he had kept for the purpose. As a painter his style is very sublime, though some commentators say he was incomparable in designing, but knew little of colouring. His greatest pieces are the Crucifixion, and the Last Judgment. An eminent traveller says of the last, that while he viewed it his blood was chilled, and he felt as if all he saw was real. He died at Rome in 1504, and his remains were interred with great funeral pomp at Florence.

**ANGELO** (St.), a town of Italy, Lat 41, 40 N. Long. 16, 12 E. There are

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several other towns and castles of the same name in Italy.

**ANGELOLATRIA**, the superstitious worship, or adoration of angels.

**ANGELOT**, in commerce, a small, fat, rich sort of cheese, brought from Normandy.

**ANGER** *s*. (from auzer, Sax *vered*) 1 Uncasiness upon receipt of any injury, with a purpose of revenge (Locke) 2 Pain, or smart of a sore (Temple)

Anger, viewed as a passion, that is, as referring to the first impression, in which we are passive, or the impression preceding the external signs, which constitute the emotion, may be considered as a painful sensation of a heating, irritating nature. It is an irksome stimulus, by which the animal spirits are troubled, and violently agitated. Where the injury appears great, totally unprovoked, too recent or sudden for the mind to call up motives of restraint, when surprise at receiving an offence from a quarter the most remote from expectation, or astonishment at base and ungrateful returns for benefits conferred, recompensing the first impulse of passion, an ardent desire of revenge is immediately excited. The imagination runs over every circumstance of aggravation, depicts the offence as a crime of the most atrocious nature, and vengeance is denounced against the aggressor, as an indispensable obligation of justice, and as a retribution due to the violated laws of morality, of honour, or of gratitude. The emotions strikingly correspond with this state of mind. The corporeal system immediately assumes attitudes and appearances calculated to inspire the offender with terror. The countenance reddens, the eyes flash indignant fire, and the whole aspect speaks horror, muscular strength is abundantly increased, and powers of exertion are acquired, unknown to cooler moments. This new appetite for revenge gains the ascendancy, not only over every consideration of compassion, but of personal safety, and impels to dangerous encounters, totally regardless of the danger. In some instances, an apprehension of dreadful consequences, a kind of preage of the mischief that may possibly ensue, and become the subject of future regret, intermixes fear with the paroxysms of anger, and a pallid tremour unites with symptoms peculiar to wrath, or accompanies the first tokens of revenge.

Anger is deservedly placed among the most violent emotions. From its ungovernable excesses (see **RECK**), it has almost appropriated to itself the term passion. When the paroxysms of anger are excessive, the subject is deaf to the most cogent reasons, or to the most pathetic representations of the mischief it may occasion, and being worked up to a degree of phrenzy he fully vindicates the adage *Ira brevis furor*. While under the influence of this turbulent emotion, the incensed person often imagines that he is solely actuated by the purest love of equity, and ardent desire to administer justice, though at the instant he may be vic-

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lating the dictates of compassion, in the perpetration of the most atrocious deeds. It is observable, that sorrow and fear, though they may be the result of culpable conduct, or even criminality, are calculated to excite our compassion. The anguish manifested by the subject, calls aloud for our sympathy; but anger, though it is a painful emotion, excites no sympathy, unless we suppose the subject to be insane. In cases where we acknowledge the provocation has been very great, our sympathy is transferred to the object of resentment, prompting us to act as mediators, and exert all our influence to mitigate or avert the punishment to which he is exposed. Cogan on the Passions, p. 111.

Collins's striking picture of Anger in his fine ode on the Passions, is as below.

Next Anger rush'd, his eyes on fire

In lightnings own'd his secret stings,

In one rapid flash he struck the lyre,

And swept with his ried hand the strings.

Bishop Butler very justly observes, that anger is far from being at all times a selfish passion, since it is naturally excited by injuries offered to others as well as to ourselves, and was designed by the Author of Nature not only to excite us to act vigorously in defending ourselves from evil, but to interest us in the defence or rescue of the injured and helpless, and to raise us above the fear of the proud and mighty oppressor. Hence therefore the precept, "Be ye angry and sin not." Anger becomes sinful, however, and contradicts the rule of scripture, when it is conceived upon slight and inadequate provocations, when its motives are low and selfish, or when it continues long. It is then contrary to the amiable spirit of charity, which "suffereth long, and is not easily provoked." Hence these other precepts, "Let every man be slow to anger, and," "Let not the sun go down upon your wrath."

To **A'NGFR** *n* *u* (from the noun) 1 To provoke, to enrage (*Clarendon*). 2 To make painful (*Bacon*).

**A'NGERLY** *ad* In an angry manner (*Shakespeare*).

**ANGERONALIA**, in antiquity, feasts celebrated at Rome in honour of Angeroni, the goddess of silence and patience.

**ANGERS**, an ancient town of France, in the late province of Anjou, and the episcopal town of the department of Maine and Loire. It contains about 30000 inhabitants. Lat 47 30 N. Lon 0 35 W.

**ANGHIERA**, the capital town of a county of the same name, of Milan, in Italy. Lat 45 42 N. Lon 8 40 E.

**ANGIGLOSSUS** (*αγγιγλωσσος*, from *αγγι*, *a* hook, and *γλωσσα*, the tongue) A person who stammers, or labours under a pœllismus.

**ANGILDUM**, in our old writers, denotes a simple gold, that is, the simple value of the man, or other thing.

**ANGINA** (*angina*, from *αγγω*, to strangle; because it is often attended with a sense

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of strangulation) A sore throat. See *CYNANCHE*.

**ANGINA PECTORIS** Syncope anginosa. An extremely dangerous disease, which seizes those who are subject to it, when walking, with a very painful sensation in the breast, threatening immediate suffocation, and often inducing syncope, but the moment they stand still all the uneasiness vanishes. A few months after the disease has taken place, the fits will not cease instantaneously on standing still, and they take place in almost all situations, sitting still, or abed, as well as when walking about. The duration of the paroxysm is uncertain at first, it goes off on being still, it then continues some time after with great palpitation of the heart, and, at length, does not leave the patient for some hours. It frequently happens that persons die soon after the attack of a fit, but cases are related where it induced some other disease which terminated in lingering illness. In all cases the seat of pain is about the sternum and heart, and very frequently there is a fixed pain in the left arm, near the insertion of the deltoid muscle. The proximate cause of this disease is not known. Ossification of the coronary arteries of the heart, and accumulation of fat about that organ, the mediastinum, pericardium, and diaphragm, have been observed in those who have died under the disease, and at times a preternatural communication between the right and left ventricles of the heart.

**ANGIOGRAPHY** *s* (from *αγγειον* and *γραφω*) A description of vessels in the human body.

**ANGIOLOGY** (*angiologia*, *αγγιολογια*, from *αγγιον*, a vessel, and *λογος*, a discourse) The doctrine of the vessels of the human body. See *ANATOMY*.

**ANGIOMONOSPERMOUS** *a* (from *αγγειον*, *μονο* and *σπερμα*) Such plants as have but one single seed in the seed-pod.

**ANGIOPTERIS** In botany, a genus of the class and order cryptogamia filices, thus characterized, fructification oval, sessile, in a line near the margin of the frond, approximate in a double row, one celled. Only one species of this fern has hitherto been traced.

**ANGIOSPERMIA** The name of the second order in the class didynamia of the Linnæan system. It is so called, because the seeds, *σπερματα*, are inclosed in a vessel, *αγγος*, or capsule in opposition to the first order, *gymnospermia*, which has naked seeds.

**ANGLE ANGULUS**, in geometry, the opening, or mutual inclination, of two lines, or of two or more planes, meeting in a point called the vertex, or angular point.

The most general division of angles is, into plane, spherical, and solid.

A *plane, rectilineal Angle*, is the inclination of two straight lines to one another, which meet together, but are not in the same straight line.

*Spherical Angle*, is an angle formed on the surface of a sphere by the intersection of two



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great circles; or, it is the inclination of the planes of the two great circles

The measure of a spherical angle, is the arc of a great circle of the sphere, intercepted between the two planes which form the angle, and which cuts the said planes at right angles. For their properties, &c. see SPHERE, SPHERICAL, and SPHERICAL TRIGONOMETRY

*Solid Angle*, is the mutual inclination of more than two planes, or plane angles, meeting in a point, and not contained in the same plane, like the angles or corners of solid bodies

Christus and some other authors have asserted, that those solid angles are equal which are contained by the same number of plane angles that are equal to one another, each to each: but this is a mistake, for Dr Simson has shewn in the notes to his valuable edition of Euclid's Elements, that there may be innumerable solid angles all unequal to one another, which are each of them contained by the same plane angles disposed in the same order. Solid angles, indeed, are magnitudes of a very peculiar kind, and may be remarked for not admitting of that accurate comparison, one with another, which is common in the other subjects in geometry. It cannot, for example, be said of one solid angle, that it is the half, or the double of another solid angle, nor did any geometer ever think of proposing the problem of bisecting a given solid angle. In fact, no multiple, or sub-multiple, of such an angle can be taken, and we have no way of expounding, even in the simplest cases, the ratio which one of them bears to another. In this respect, therefore, a solid angle differs from every other magnitude that is the subject of mathematical reasoning, all of which have this common property, that multiples and sub-multiples of them may be found. We do not here enquire what is the reason of this anomaly, but it is obvious that, on account of it, our knowledge of the nature and properties of such angles can never be very far extended, and that our reasonings concerning them must be chiefly confined to the relation of the plane angles by which they are contained. Having premised these general definitions and remarks, we now proceed to some that are more particular, confining our attention chiefly to plane angles.

Angles are sometimes denoted, or named, by the single letter placed at the angular point, as *A*, *B*, &c. fig. 10 pl. 12 and sometimes by three letters, placing always that of the vertex in the middle. The former method is used when only one angle has the same vertex; and the latter method is necessary when several angles have the same vertex, to distinguish them from one another.

The measure of an angle, by which its quantity or magnitude is expressed, is an arch, as *D E* described from the centre *A*, with any radius at pleasure, and contained between its legs *A B* and *A C*. Solid angles are com-

pared and distinguished by the ratio of the arcs which subtend them to the whole circumference of the circle, or by the number of degrees contained in the arc *D E* by which they are measured, to 360, the number of degrees in the whole circumference of the circle. And thus an angle is said to be of so many degrees, viz. as are contained in the arc *D E*.

Hence it matters not with what radius the arc is described, by which an angle is measured, when great or small, as *A D*, or *A d*, or any other for the arcs *D E*, *d e*, being similar, have the same ratio as their respective radii or circumferences, and therefore they contain the same number of degrees. Hence it follows, that the quantity or magnitude of the angle remains still the same, though its legs be ever so much increased or diminished. And thus, in similar figures, the like or corresponding angles are equal.

The taking or measuring of Angles, is an operation of great use and extent in surveying, navigation, astronomy, &c. The instruments chiefly used for this purpose are QUADRANTS, SEXTANTS, OCTANTS, THEODOLITES, CIRCUMFERENTERS, &c. for the description and use of which, see the respective articles in this Dictionary. For measuring the quantity of an angle on paper, M de Lagny gave, in the Memoirs of the Royal Academy of Sciences, a new and very ingenious method, which we shall describe under the article GONIOMETRY.

ANGLES, with regard to the form of their legs, are divided into rectilinear, curvilinear, and mixed.

*Angle, rectilinear, or right lined*, is that whose legs are both right lines.

*Angle, curvilinear*, is that whose legs are both of them curves.

*Angle, mixt, or mixtilinear*, is that, one of whose sides is a right line, and the other a curve.

With regard to their quantity, angles are again divided into right, and oblique, acute, and obtuse.

*Right angle*, is that which is formed by one line perpendicular to another, or that which is subtended by a quadrant of a circle, as the angle *ABC* (fig. 14). Therefore, the measure of a right angle is a quadrant of a circle, or  $90^\circ$ , and consequently all right angles are equal to each other.

*Oblique angle*, is a common name for any angle that is not a right one; and is either acute or obtuse.

*Acute angle*, is that which is less than a right angle, as the angle *DBC*: fig. 14.

*Obtuse angle*, is that which is greater than a right angle, as *EBC*: fig. 14 pl. 12.

Angles are distinguished with regard to their situation relatively to each other, into contiguous, adjacent, vertical, opposite, and alternate.

*Contiguous angles*, are such as have the same vertex, and one leg common to both, as

# ANGLE

EBA, ABD (fig 14) which have AB common

*Adjacent angles*, are those of which a leg of the one produced forms a leg of the other as the angles AEC and BEC, (fig 12) which have the legs AE and EB in a straight line. Hence adjacent angles are supplements to each other, making together  $180^\circ$ , or two right angles.

*Vertical or opposite angles*, are such as have their legs mutually continuations of each other as CEA and BED, or CEB and AED, (fig 12). Vertical or opposite angles are always equal to each other as  $\angle AED = \angle CEB$ .

*Alternate angles*, are those made on the opposite sides of a line cutting two parallel lines. See ALTERNATE ANGLES.

*Angle at the centre of a circle*, is an angle in a circle, whose vertex is in the centre of that circle: as AEC, fig 1 pl 13.

*Angle at the periphery, or in a segment*, is an angle whose vertex is in the periphery, and its legs two chords of the circle. Thus AB, BC, are two chords of the circle ABCD, (fig 1) making an angle B at the periphery, which is called an angle in a segment.

This angle is always equal to half the angle at the centre, standing upon the same arch. Also, all angles in a segment, standing upon the same arch, are equal to one another. Thus the angles ABC, AGC, AFC, are equal, and are each equal to half the angle AEC at the centre.

If the right line AB (fig 13 pl 12) touch the circle in C, and the chord CD be drawn, then will the angle ACD be equal to any angle CIE D, made in the segment DEC.

When the arch is a semicircle, the angle will be a right angle. Thus if the arch ABC (fig 15) be a semicircle, the angle ABC will be a right angle. When it is greater than a semicircle, the angle will be acute, but when less, it will be obtuse.

*Angle of contact*, is that made by a curve line and a tangent to it, at the point of contact, as the angle IHK (fig 11 pl 12). It is proved by Euclid, that the angle of contact between a right line and a circle, is less than any right-lined angle whatever, though it does not therefore follow that it is of no magnitude or quantity. This has been the subject of great disputes amongst geometers, in which Peletarius, Clavius, Tacquet, Wallis, &c bore a considerable share, Peletarius, Ozanam, and Wallis contending that it is no angle at all, against Clavius, who rightly asserts that it is not absolutely nothing in itself, but only of no magnitude in comparison with a right-lined angle, being a quantity of a different kind or nature, as a line in respect to a surface, or a surface in respect to a solid, &c. And since his time, it has been proved by sir I. Newton, and others, that angles of contact can be compared to each other, though not to right-lined angles, and what are the proportions which they bear to each other. Thus, the circular angles of contact IHK, IHL, are to each other

in the reciprocal subduplicate ratio of the diameters HM, HN. And hence the circular angle of contact may be divided, by describing intermediate circles, into any number of parts, and in any proportion. And if, instead of circles, the curves be parabolas, and the point of contact H the common vertex of their axes, the angles of contact would then be reciprocally in the subduplicate ratio of their parameters. But in such elliptical and hyperbolic angles of contact, these will be reciprocally in the subduplicate of the ratio compounded of the ratios of the parameters, and the transverse axes. See Hutton's Dictionary, and MacLaurin's Flux vol II p 473-474.

*Angles*, in mechanics. 1 Angle of direction, is that comprehended between the lines of direction of two conspiring forces. 2 Angle of elevation, is that which is comprehended between the line of direction, and any plane upon which the projection is made, whether horizontal or oblique.

*Angle of incidence*, in optics, the angle which a ray of light makes with a perpendicular to that point of the surface of any medium on which it falls, though it is sometimes understood of the angle which it makes with the surface itself.

*Angle of refraction*, now generally means the angle which a ray of light, refracted by any medium, makes with a perpendicular to that point of the surface, on which it was incident, but has sometimes been understood of the angle which it makes with the surface of the refracting medium itself. It is a constant law of refraction that the ratio of the sines of incidence and refraction, is a fixed ratio, whatever be the obliquity of the incident ray, the media remaining. See REFRACTION.

*Angle in astronomy*. As angles of commutation, elongation, parallactic angle, &c. See COMMUTATION, ELOVIGATION, &c.

*Angle at the sun*, the angle under which the distance of a planet from the ecliptic appears at the sun.

*Angle of obliquity of the ecliptic*. See ECLIPTIC, and OBLIQUITY.

*Angle of longitude*, the angle which the circle of a star's longitude makes with the meridian at the pole of the ecliptic.

*Angle of the rhumb*, in navigation. See RHUMB, and LAXODROMIC.

*Angles*, in fortification, are understood of those formed by the several lines used in fortifying, or making a place defensible.

These are of two sorts, real, and imaginary. —Real angles are those which actually subsist and appear in the works. —Such are the flanked angle, the angle of the epaule, angle of the flank, and re-entering angle of the counter-scarp. —Imaginary, or occult angles, are those which are only subservient to the construction, and which subsist no more after the fortification is drawn. —Such are the angle of the centre, angle of the polygon, flanking angle, salient angle of the counter-scarp, &c.

*Angle of, or at, the centre*, is the angle formed

## A N G

at the centre of the polygon, by two radii drawn from the centre to two adjacent angles, and subtended by a side of it, as the angle ACB, (fig 2 pl 13) This is found by dividing 360° by the number of sides in the regular polygon

*Angle of the polygon*, is the angle intercepted between two sides of the polygon, as DAB, or ABE This is the supplement of the angle at the centre, and is therefore found by subtracting the angle C from 180 degrees

*Angle of the triangle*, is half the angle of the polygon, as CAB, or CBA, and is therefore half the supplement of the angle C at the centre

*Angle of the bastion*, is the angle FAG made by the two faces of the bastion And is otherwise called the flanked angle

*Diminished angle*, is the angle BAG made by the meeting of the exterior side of the polygon with the face AG of the bastion

*Angle of the curtain, or of the flank*, is the angle GHI made between the curtain and the flank

*Angle of the epaule, or shoulder*, is the angle AGH made by the flank and the face of the bastion

*Angle of the tenaille, or exterior flanking angle*, is the angle AKB made by the two distant lines of defence, or the faces of two bastions produced

*Angle of the counterscarp*, is the angle made by the two sides of the counterscarp, meeting before the middle of the curtain

*Angle, flanking inward*, is the angle made by the flanking line with the curtain

*Angle forming the flank*, is that consisting of one flank and one demi-gorge

*Angle forming the face*, is that composed of one flank and one face

*Angle of the moat*, is that made before the curtain, where it is intersected

*Re-entering, or re-entrant angle*, is that whose vertex is turned inwards, towards the place, as H or I

*Salient, or sortant angle*, is that turned outwards advancing its point towards the field, as A or G

*Dead angle*, is a re-entering angle, which is not flanked or defended

**ANGLE** *s* (angel, German) An instrument to take fish, consisting of a rod, a line, and a hook (Pope)

**To ANGLE** *v a* (from the noun) 1 To fish with a rod and hook (Waller) 2 To try to gain by some insinuating artifices (Shakespeare)

**ANGLE-BERRIES** Excrescences to which cows are subject chiefly about the abdomen They are commonly sarcomatous, sometimes with a broad base and sometimes hanging from a pedicle They are easily removed by excision on their first appearance, and even afterwards if of the latter description, by passing a tight ligature round the base of the pedicle If the base of the excrescence be broad it should be dissected out.

## A N G

**ANGLE-ROD** *s* (angel rode, Dutch) The stick to which the fisher's line and hook are hung (Addison)

**ANGLER** See **LOPHIUS**

**ANGLER** *s* (from angle) He that fishes with an angle (Dryden)

**ANGLES**, an ancient German nation, originally a branch of the Suevi after various migrations they settled in that part of Denmark which is still called Angel, and of which Hensburg is the capital To this nation the British ambassadors applied, when soliciting succours against the Scots and Picts The Angles, therefore, came over in greater numbers than any other Saxon nation, and accordingly had the honour of giving the name of Angli to England

**ANGLESLA**, or **ANGLSEY** (isle of,) is the most western county of North Wales It was anciently called Mona and was the seat of the Druids It contains about 200 000 acres, nearly 5000 of which are uncultivated It is divided into 6 hundreds, having 74 parishes, 2 market towns, and about 34000 persons This county is fertile, abounding in corn, cattle, fish, and fowl

This island once formed a part of the main land of Wales The chief town is Beaumaris The greatest curiosity which Angles can boast, and the chief source of its wealth is the Paris mountain, the name of which is most probably derived from the old Welsh word

Pras, signifying "brass, which might easily be corrupted into Paris The copper-mines in this part of the island are supposed to have been known and worked by the Romans The mine of this mountain is considerably more than a mile in circumference, and, on an average, 1300 men are constantly employed in it It has the singular advantage of being worked in the open air, a circumstance which expedites the labour, and secures the health of those that are employed

**ANGLIA** *IASI* in history, one of the kingdoms of the Heptarchy, founded by the Angles that landed on the eastern coasts of Britain It contained the two counties of Norfolk and Suffolk, with part of Cambridgeshire Ethelbert, the last sovereign of this kingdom, was murdered, by Offa, king of Mercia, in 792 after which East Anglia was united with Meier

**ANGRICANE GUTTÆ** See **GUTTÆ**

**ANGLICISM** *s* (from Anglus, Lat) An English idiom (Milton)

**ANGLICUSUDOR** (from Anglia, English, and sudor, sweat) The sweating sickness, a disease once sporadic to Englishmen, or endemic to the country, but now no longer in existence

**ANGLING**, the art of catching fishes by rods, hooks, and lines, accompanied often with floats and other tackle, of different construction, with baits natural or artificial, according to the season of the year and the fish intended to be caught The species of fishes which chiefly engage the attention of the angler are bream.

## A N G L I N G.

chub, barbel, smelt, salmon, grayling, gudgeon, bleak, dace, roach, perch, pike, carp, tench, trout, pike, eel. In illustration of the soundings, seasons, baits, and floats, see the table in the next page.

For the rod, the hazel, and especially the cob-nut, affords the best, straightest, and most tapering wood, which should be cut about Christmas, and not used till duly seasoned.

The rod should generally consist of three or four parts, diminishing in size with nicety, but with their approximating ends exactly fitted to each other whether glued together, so as to form one inseparable piece, or feruled so as to slide into each other at will. To preserve it from moisture, and especially, to maintain its elasticity, it should be varnished with scraped caoutchouc or Indian rubber, dissolved in linseed oil, with a moderate proportion of seed or shell lac, applied with a camel-hair pencil. The salmon rod, all but the whalebone top, is usually made of ash, as being the lightest wood; but sometimes, the rod for general purposes is composed of different woods, the butt being of yellow deal, seven feet long; next a straight hazel of about six feet, and then a delicate piece of fine grained yew, accurately tapered and ending in a point of whalebone, the suring together about two feet.

The hairs most proper for the line is that taken from a young, healthy, grey or white sturgeon, and which is of a pale transparent water colour, that from the middle of the tail is best. They should be well washed in water, and slowly dried. They should be also well sorted, for every hair in every link should be equally big, round and even, that the strength may be so proportionate, that they will not break singly, but all together. Sorrel, chesnut, or brown hairs, however, are best for ground angling, especially in muddy water, as they nearly resemble the colour of the water.

Floats are of many kinds, of swan, goose, Muscovy duck, and porcupine quills. They should be so loaded a just to suffer their tops to appear above the surface, that the slightest nibble may be perceived. But for heavy fishing with worm or minnow, a cork float is best, which is made by taking a cork free from flaws, and boring with a small red hot iron a hole lengthways through the centre. It is then to be cut across the grain with a sharp knife about two thirds of the length, and the remaining third (which is the top of the float) rounded with it, and then neatly finished with pumice-stone, the whole to resemble in shape a child's peg-top. In fishing with a float, the line should be a foot shorter than the rod; if longer it is inconvenient when a fish is wanted to be disengaged, and the rod should be from fourteen to fifteen feet long, light, stiff, and so smart in the spring as to strike at the extremity of the whale-bone.

The hooks demanded in the general science of angling are far more diversified than the floats, and must be for the most part adapted to the species of fish intended to be fished for.

Their excellence depends on their being so tempered as not to snap, and yet not to bend with the force of the fingers. In choosing them those should be preferred that are longest in the shank, strong, and rather deep in the bed, the point fine and straight, and as true as it can be set to the level of the shank, the point should be sharp, and the barb of a simple length. When hooks are blunt a small whetstone will restore their sharpness much better than a file, which always leaves them rough and jagged.

When the angler means to fish at bottom he must take care to have with him a general assortment of tackle, independently of that already enumerated, such as different kinds of lines neatly coiled up, strong single hairs, hooks untied of various sorts, as well as hooks tied to bottom links of coarse and fine gimp, of twisted and single silk-worm gut, of hog's bristles, and of white and sorrel hair. He must likewise be provided with cork and quill floats and spare caps, shot split and small pistol bullets to poise the floats, shoemaker's wax in a piece of leather, for the purpose of arming the hooks, silk of various sizes and colours, recollecting that hooks for worm-fishing and red-paste are usually tied on with scarlet, those for gentles with yellow paste, and for grubs with straw-coloured silk a plummet to ascertain the depth of the water when a float is used, a clearing-ring to disentangle the hook, which is used by running it along and over the top of the rod, and gradually down the line to where the hook is fast, if at a stump or other immovable substance, but if it be hung to weeds, let the ring get below the hook, then pull the twine, and the ring will break the weeds, and thus save both line and hook. In the former case if it do not release the hook, it will enable the line to be broken near to it, and prevent the line from being strained in any other part. The angler must also be provided with a sharp pen-knife, pair of scissors, small whetstone, landing net, disgorging, and light fish-basket, panner or creel. Of coloured clothes green is the best to angle in, as the least likely to excite attention among fishes, but glaring colours should by all means be avoided. In a pond the best place to try our sport is where cattle go to drink, for the harmless disturbances they are accustomed to in such places the fish keep free from suspicion. Deep waters are preferable to shallow, as being less agitated by wind and weather. The best season for angling is from April to October, the best times of the day from three till nine in the morning, and from three till dark in the afternoon.

The annexed table contains a useful catalogue of the different fishes that constitute the chief subject of angling, of the places where found, season, time of angling, depth, and baits. We extract it from Mr. Daniel's Rural Sports but shall give a more particular description under the several names of the fishes that are most celebrated for amusement.

TABLE FOR BAITS.

Name, and where found	Season	Time to angle	Depth from Ground	Baits			
				Worms	Flies	Pastes	Fish Gr.
<b>BREAM</b> In rivers in soft mud in the deepest and broadest parts near weeds where the bottom is clay or sand in ponds in the quietest and deepest parts	From May till Sept.	3 In the morning until 8 and from 3 in the afternoon until dark.	Touch the ground	1, 3, 7	2. Under water	1, 2	8. In June or July
<b>CRUISE</b> In angles and deep holes of rivers where the stream is not rapid under shade of trees, weeds or hollow banks in a clayey or sandy bottom	From Aug. till March best in winter months	In mild cloudy weather will bite all day, in hot from sun-rise till 9 and from 3 p.m. till sun-set; in cold the mid of day	In fishing with float in warm weather, at mid water; in cool lower; in cold at the ground	1, 2, 4, 5, 6	1, 2, 3, 4, 5	12	7, 8, 9
<b>BARBEL</b> Middle of pond in rivers during summer, the strongest currents, under bridges near willows, among piles, low places and under mossy weeds	From May till Aug.	From sun-rise till 10 in the morning, and from 4 p.m. till sun-set.	Touch ground.	1, 2, 7, 9	4		
<b>SMELT</b> In docks, and at the sterns of ships in tide rivers - To fish at sterns a sterner line with five or six hooks is to be used	From April till Oct.	All the day; best when the tide runs up	The baits to sink 2 or 3 yards.	1, 2, 3, 5, 9			cut in pieces 10. small and unboiled 1
<b>SALMON</b> Violent streams and large rivers, whilst at feed when off their prey, the deep and broad parts and generally middle of the river near the ground.	From April till Aug.	From 6 till 9 in the morning and from 3 p.m. till sun-set	Touch ground with loam - worm smaller worms, bobs and cad bait at top of the water	7	Large and the more gundy the better		
<b>GRAYLING</b> Chief bottom clear water and swift streams	All the year Chief from Sept. to Jan.	All day in cool cloudy weather	Cold weather at bottom in hot weather top or mid water	1, 2, 3, 4, 5, 6, 8, 9	1, 2, 3, 4, 5, 6, 7		
<b>GUDGEON</b> Cravelly sandy ground, and gentle streams	From May till Oct.	All day	Near, or on the ground	3, 9			
<b>BLEAK</b> Sandy bottom, deep rivers; at the sides and tails of streams, where the water eddies and turns gently back; ships are	All the year but May when they are spawning	All day	A little deeper than mid-water	6, 9	12"	1	
<b>DACE</b> Sandy bottom, deep rivers; holes well shaded in summer; shallow near fords, under banks, and among weeds	From April to Feb best in winter	All day	3 inches from bottom at top of the water	1, 2, 3, 6, 9	1, 2, 3, 4, 5, 6, 7	5, 6	
<b>ROACH</b> Deep gentle running water; holes that are well shaded having the gravel or sandy bottom; ships sterns, bridges	From July till March best in Feb.	In mild cloudy weather all day in hot morn & eve in cold the mid of day	1 inch from bottom	1, 2, 3, 4, 5, 6, 7	1, 2, 4, 7	156, 8	
<b>PERCH</b> In rivers; gentle streams not over deep, where there are weeds, hollow banks, and at gravelly bottoms; in ponds, deep holes, near weeds or stumps of trees	From April till Jan.	Sun-rise till 10; from 2 till sun-set; in cloudy weather with ruffling south wind will bite all day	Mid water or 6 inches from bottom	1, 2, 6, 8, 9			1 c
<b>POPE</b> Deep still water	May to Oct.	All day	6 inches from bottom	9			
<b>CARP</b> Still deep muddy bottoms, pond or river	Mar to Aug.	Early and late as possible	3 inch from bottom mid water in hot weather	1, 2, 3, 4, 8		3, 9 c	
<b>TENCH</b> River or pond, among weeds, muddy bottom	From Sept till June	Early and late as possible	6 inches from bottom among weeds if deep mid wat in hot weather	1, 2, 4, 9			
<b>TROUT</b> Swift clean rivers over pebbles, stony bottoms	Mar to MI chaelmas	All day	Cold weather 6-inch to 10 inch from bottom in hot top to mid water	1, 7, 9 c, 8, 9	1, 2, 3, 4, 5, 6, 7		1 c, 9
<b>PIKE</b> Sandy or clay bottoms, under bull rush, reeds, water-docks, or bottom.	From May till Feb	With a gentle gale all day	Mid water, if with a float and single snap-hook				1 3 c
<b>EEL</b> Among weeds, under roots and holes in banks and stones at bottom, about bridges weirs and mills	From May till Sept.	All day when the water is thick by rains	On the ground	6, 7			1 c

## Description of Bats and Worms

1. *Large Red Worm* found in sandy or light ground after the plough the rooks will direct where this grub is to be met with by their close attention on the plough is white bigger than a gentle with a red head. Another is found in sandy ground with a black or blue head. Neither of these are to be got by digging one spike into the above-mentioned soils where they are long long remained unploughed. Keep them in a garden vessel well covered with a sufficient quantity of the mould they harbour in with dry straw at top and let them be in a warm place, as a chamber from the beginning of November till the middle of April.

2. *Small Red Worm* found from putrid flesh let them be in a vessel bran two or three days before using.

3. *Small Worm* found amongst roots of flags in a garden, to be got and thinner than a gentle worm to be kept in a glass.

4. *Small Worm* found in the earth below using a spade to get them out when the ground is drawn or dry them on a sieve before the fire, just to harden and make them firm.

5. *Small Worm* found under a stone from May till September is larger but like a gentle to be kept in a glass.

6. *Small Worm* found in the earth below using a spade to get them out when the ground is drawn or dry them on a sieve before the fire, just to harden and make them firm.

7. *Small Worm* found in the earth below using a spade to get them out when the ground is drawn or dry them on a sieve before the fire, just to harden and make them firm.

8. *Small Worm* found in the earth below using a spade to get them out when the ground is drawn or dry them on a sieve before the fire, just to harden and make them firm.

9. *Small Worm* found in the earth below using a spade to get them out when the ground is drawn or dry them on a sieve before the fire, just to harden and make them firm.

10. *Small Worm* found in the earth below using a spade to get them out when the ground is drawn or dry them on a sieve before the fire, just to harden and make them firm.

become tough and fitter for angling than when first taken from the water.

7. *Red Worm* found in gardens is very large having a red head, a streak down the back and a broad flat tail those with a head are fit only for feed.

8. *March Worm* found in marshy ground are of a bluish colour and require more scouring in it is then most other worms are a good bait from March to Michaelmas.

9. *Handling Red or Black Worm* found in rotten dung-hills and tanner's bark that has been used. The red worm found at the root of a great dock and which lies wrapt up in a round glue is a particular bait for brown. The common red worm is very good for all small fish.

## Flies to be found

1. *Small Fly* under hollow stones at the sides of rivers is of a brown colour with yellow streaks on the back and belly has large wings in season from April to July.

2. *Green Drosophila* among stones by rivers sides, has a yellow body ribbed with green, is long and slender his wings like a butterfly's his tail turns on his back very good from May to mid summer.

3. *Old Fly* upon the body of an old oak or ash tree with its head downwards is of a brown colour. From May to September. Excellent for trout in clear water putting a cork on the point of the hook and letting it sink a few inches and gradually raising it.

4. *Patience Fly or Worm* upon the leaves of a plant, is commonly called a caterpillar when taken in a fly, very good for trout.

5. *Small Fly* in ant-hills From June to September.

A handful of the earth with as much of the grass in it grows on their hillsides put into a glass bottle with the ant flies, will keep them alive.

6. *May Fly* playing at the river side especially in the rain.

7. *Red Fly* upon every hawthorn bush after the buds appear.

8. *Ant Fly* flies may be procured at the shops where fishing tackle is sold. Worms of various sorts and other baits are also generally kept in the season ready prepared for use.

## Pasties how to be made

1. *Red Paste* the crumb of the new white bread (without being made wet) worked up in the hand and coloured with vermilion as near as possible to that of the salmon's rose.

2. *Brown Paste* the crumb of brown bread mixed with honey worked up in the same manner.

3. *Sand of a shup* a cart mixed with honey and flour and worked to a proper consistence.

4. *Old Cheese* grated, butter sufficient to work it and coloured with saffron if in winter use the fat of racy bacon instead of butter.

5. *Crumb of bread* worked with honey of sugar and molten with gum ivy water.

6. *Brad chewed*, and worked in the hand until stiff.

## Fish and Insects

1. Minnow  
2. Gudgeon  
3. Roach  
4. Dace  
5. Smelt  
6. Yellow Frog  
7. Small fish  
8. Grasshopper  
9. Beetle  
10. Shrimp

## A N G L I N G

In the middle of March, till which time no man should catch a trout, or in April, if the weather be dark, or a little windy or cloudy, the best fishing is with the palmer worm, but of this there are divers kinds, or at least of divers colours, the palmer-worm and the may-fly are the ground of all fly-angling, they are to be thus made

First, arm your hook with the line in the inside of it, then take your scissors, and cut as much of a brown mallard's feather as will make its wings, having regard to the size of your hook, lay the outmost part of your feather next your hook, then the point of the feather next the shank of your hook, and having so done, whip it three or four times about the hook with the same silk with which your hook was armed, and having made the silk fast, tack the hackle of a cock or capon's neck, or a plover's top, which is usually better strip off the one side of the feather, and then take the hackle, silk, or crewel, gold or silver thread, make these fast at the bent of the hook, or below your arming, then take the hackle, the silver or gold thread, and work it up to the wings, shifting or still removing your finger, as you turn the silk about the hook, and still looking at every stop or turn, that your gold, or what materials soever you may make your fly of, lie right and neatly, and if you find they do so, when you have formed the head, make all fast then work your hackle up to the head, and make that fast, and with a needle or pin divide the wing into two, with the arming silk whip it about cross-ways betwixt the wings, and with your thumb turn the point of the feather towards the bent of the hook, and work three or four times about its shank, view the proportion, and if all be next and to your liking, fasten the silk

No direction, however, can make a man of a dull capacity work a fly well, and yet these rules with a little practice, will help an ingenious angler in a good degree but to see a fly made by an artist is the best mode of learning, and then an ingenious angler may walk by the river side, and mark whatever flies fall on the water that day, and catch one of them, if he see the trout leap at a fly of that kind, and having six or seven hooks ready hung with him, and a bag also with him, with bears hair, or the hair of a brown heifer hackles of a cock or capon, several coloured silks, and crewel to make the body of the fly, the feathers of a drake's head, black or brown sheep's wool, or hog's wool, or hair, thread of gold and of silver, silk of several colours, especially sad coloured, to make the fly's head, having these with him in a bag, he may imitate and hit off the fly to a perfection that none can well teach him; and if he have the luck to hit also where there is store of trouts, a dark day, and a right wind, he will catch such numbers of them as will encourage him to grow more and more in love with the art of fly-making

Let him not fail then to be provided with bears hair of divers colours, as grey, dun,

light and dark coloured, bright brown, and that which shines also camels hair, dark, light, and of a colour between both bidge's hair, or fur spaniels hair from behind the ear, light and dark brown, blackish and black hog's down, which may be had about Christ-mas of butchers, or rather of those that make brawn, it should be plucked from under the throat, and other soft places of the hog, and must be of the following colours, viz black, red, whitish, and sandy, and for other colours, you may get them dyed at a dyer's; seal's fur is to be had at the trunk-makers, get this also dyed of the colours of cows and calf's hair, in all the different shades, from the light to the darkest brown, cow's or calf's hair are harsh, and will never work kindly, nor be handsomely get mohairs, black, blue, purple, white, violet, Isabella, which colour is described as of a bright gold colour purple, philomot, from feuille morte, a dead leaf, yellow and orange camlets, both hair and worsted, blue, yellow, dun, light and dark brown, red, violet, purple, black, horse-flesh, pail, and orange colours Some recommend the hair of abortive colts and calves, but seal's fur, dyed as above, is much better

A piece of an old Turkey carpet will furnish excellent dubbing, untwist the yarn, and pick out the wool, carefully separating the different colours, and lay it by

Some use for dubbing barge sail, concerning which we observe that the sails of west country and other barges, when old, are usually converted into tilts, under which there is almost a continual smoke arising from the fire and the steam of the beef-kettle which all such barges carry, and which, in time, dyes the tilt of a fine brown, this would be excellent dubbing, but that the material of these sails is sheep's wool, which soaks in the water, and soon becomes very heavy however, get of this as many different shades as you can, and have seal's fur and hog wool dyed to match them, which, as they are more turgid, stiff, and light, and so float better, are in most cases to be preferred to worsted, crewels, and indeed to every other kind of wool, and observe that the hog-wool is best for large, and the seal's fur for small flies

Get also furs of the following animals, viz the squirrel, particularly from his tail, fox cub, from the tail, where it is downy and of an ash colour, an old fox, an old otter, otter cub, badger, fulmart, or filmart, a hare, from the neck, where it is of the colour of withered fern, and, above all, the yellow fur of the marten, from the gills or spots under the jaws. All these, and almost every other kind of fur, are easily got at the furrier

Hackles are a very important article in fly-making they are the long slender feathers that hang from the head of a cock down his neck, there may also be fine ones got from near the tail be careful that they are not too rank, which they are when the fibres are more than half an inch long, and for some purposes these



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are much too big be provided with those of the following colours, viz red, dun, yellowish, white, orange, and perfect black, and whenever you meet, alive or dead, with a cock of the game breed, whose hackle is of a strong brown-red, never fail to buy him, but observe that the feathers of a cock chicken, be they ever so fine for shape and colour, are good for little, for they are too downy and weak to stand erect after they are once wet, as are also those of the Bantam cock.

Feathers are absolutely necessary for the wings and other parts of flies, get therefore feathers from the back and other parts of the wild mallard, or drake, the feathers of a partridge, especially those red ones that are in the tail, feathers from a cock pheasant's breast and tail, the wings of a blackbird, a brown hen, of a starling, a jay, a land-rail, throistle, a fieldfare, and a water coot, the feathers from the crown of the pewit, plover, or lapwing, green and copper-coloured peacock's and black ostrich herle, feathers from a heron's neck and wings; and remember, that in most instances, where the drake's or wild mallard's feather is hereafter directed, that from a starling's wings will do much better, as being of a finer grain, and less spungy.

Be provided with marking silk of all colours, fine but very strong, flax silk, gold and silver flattened wire or twist, a sharp knife, hooks of all sizes, hog's bristles for loops to your flies, shoemaker's wax, a large needle to raise your dubbing when flattened with working, and a small but sharp pair of scissors.

The use of a bag is attended with many inconveniences, of which, the mixing and wasting your materials are not the least to prevent which the following method is recommended: take a piece of fine-grained parchment, of seven inches by nine, and fold it so that the size and proportion of it will be that of a small octavo volume, then open it, and through the first leaf, with a sharp penknife and ruler, make three cross cuts, at the same proportionable distance as those in pl XC fig 1 and with a needle and silk stitch the two leaves together, as in that figure, let each of the margins be half an inch at least.

Then with a pair of compasses, take the distance from A to B, and set it in the middle of a small piece of parchment, and likewise set on the same distance to the right and left, and at each extremity cut off, with a penknife and ruler, the square parchment, observing that the sides are exactly parallel.

At about a quarter of an inch from the top, make a cut through the first and third divisions, and with a pair of scissors snip out the loose pieces.

Then set on the distance from A to C, and cut as before, leaving the middle division an inch longer at bottom than the others when this is done, your parchment will have the shape and proportion of fig 2, and you may cut the upper flap as it appears there.

Be careful that the cuts, and indeed all your

work, be exactly square, and then turn in the sides and ends of the parchment, so cut as before, and press the folds with a folding stick, and you will have one pocket, shaped as fig 3, which put into the first partition.

Pursue the same method with the same pockets, and those for the other partitions, and in this manner proceed till you have completed six leaves, which are to make the first of your book, the larger of these pockets are to hold hog's wool, seal's fur, and bear's hair, and the smaller the finer furs, which are those of the marten, fox cub, &c.

In each of the six divisions, in every leaf, with a saddler's holew punch, make a hole, to which end take a thin narrow stick of beech, or any hardish wood, and, when the pocket is in its place, put the stick down into the pocket, and, observing the centre of the division, give the punch a smart blow with a mallet, these holes will show what is contained in each of the pockets.

The next leaf may be single, stitch it across with double silk diagonally, and cross those stitches with others, and the spaces will be of a lozenge shape. Let the stitches be half an inch in length, into these you are to tuck your dubbing, when mixed ready for use.

The next leaf should be double, stitched with a margin as the others, and through the first fold cut a lozenge, as big as the size will allow of, into this you may tuck three or four wings of small birds, as the starling, land rail, throistle, &c. At the back of this leaf sew two little parchment straps, of half an inch wide, very strong, through which put a small but very neat and sharp pair of scissors.

You may, on another single leaf, make four or five cross bars of long stitches, through which, as well on the back as the fore side, you may put large feathers, namely, those of a cock pheasant's tail, a ruddy brown hen, &c.

The next three leaves should be double, stitch them through the middle, from side to side, and with the compasses describe a circle of about an inch and a half diameter, cut out the parchment within the circle, under some of the margins, when leaves are stitched together, tuck peacock's and ostrich herle, and in others lay neatly the golden feathers of a pheasant's breast, and the grey and dyed yellow mail of a mallard.

Three double leaves more, with only two large pockets in each, may be allotted for silk of various colours, gold and silver twist, and other things, six single leaves in addition will complete your book, stitch them from side to side with distances of half an inch, and cross those stitches with others, from top to bottom with somewhat greater distances, and into every other space, reckoning from top to bottom, lay neatly and smoothly a starling's feather, do the same on the backside, and so for two leaves.

The remaining leaves you may fill with land-rail's and other small feathers, plover's tops, and red and black hackles.



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The first and last leaves of your book may be double, stitched in the middle, from side to side, but open at the edges which will leave you four pockets like those of a common pocket-book, into which you may put hooks, and a small piece of wax, wrapped in a bit of glove leather.

To the page that contains the mixed dubbings, there should be an index, referring to every division contained in it, and expressing what fly each mixture is for.

When your book is thus prepared, send it to the binder, with directions to bind it as strong as possible, let him leave a flap to one of the boards, and fasten to it a yard of ribband to tie it.

The utility and manifold conveniences of a book are apparent, and whoever will be at the pains of making such a one as this, will find it far preferable to a magazine-bag.

In general we shall give the different methods of angling under the names of the different fishes angled for—we shall nevertheless offer in the present article, a few observations upon the more commonly sought after.

The **PIKE** loves a still, shady, unfrequented water, and usually lies amongst or near weeds, such as flags, bulrushes, candocks, reeds, or in the green foam that sometimes covers standing waters, though he will occasionally shoot out into the clear stream. He is caught variously at the top and in the middle, and often, especially in cold weather, at the bottom of the river.

Pikes are called jacks till they become twenty-four inches long.

The bait for pikes besides those mentioned under the article **PIKE**, are a small trout, the loche and muller's thumb, the head end of an eel, with the skin taken off below the fins, a small jack, a lob-worm and, in winter, the fat of bacon. And notwithstanding what some say against baiting with a perch, it is confidently asserted, that pikes have been taken with a small perch, when neither a roach or bleak would tempt them.

All your baits for pikes must be as fresh as possible. Living baits you may take in a tin kettle, changing the water often, and dead ones should be carried in fresh brim which will dry up the moisture that otherwise would rot them.

Pikes are angled for in two ways by the troll, and for the snap. In trolling, the head of the bait-fish must be at the bent of the hook, but, in fishing at the snap, the hook must come out at or near the tail. The essential difference, however, between these two methods is, that in the former the pike is always suffered to pouch or swallow the bait, but in the latter you are to strike as soon as he has taken it.

The rod for trolling should be about three yards and a half long, with a ring at the top for the line to run through, you may fit a trolling-top to your fly-rod, which needs only to be stronger than the common fly-top.

Let your line be of green or sky-coloured silk, thirty yards in length, which will make it necessary to use the wench, with a swivel at the end.

The common trolling-hook for a living bait consists of two large hooks, with a common shank, made of one piece of wire, of about three quarters of an inch long, placed back to back, so that the points may not stand in a right line, but incline so much inwards as that the shank may form an angle little less than equilateral. At the top of the shank is a loop left in bending the wire, to make the hook double, through which is put a strong twisted brass wire of about six inches long, and to this is looped another such link but both so loose that the hook and the lower link may have room to play to the end of the line fasten a steel swivel.

But there is a sort of trolling-hook different from this, and which is thought preferable, which will require another management. This is no other than two single hooks tied back to back with a strong piece of gimp between the shanks, in whipping the hooks and the gimp together, make a small loop, and take into it two links of chain of about an eighth of an inch diameter, and into the lower link, by means of a small staple of wire, fasten, at the greater end, a bit of lead of a conical figure, and somewhat sharp at the point. The e hooks are to be had at the fishing tackle shops, ready fitted up, but for the form of them, see pl. XC. fig. 5.

This latter kind of hook is to be thus ordered, viz put the lead into the mouth of the bait-fish, and sew it up the fish will live some time, and though the weight of the lead will keep his head down, he will swim with nearly the same ease as if at liberty.

If you troll with a dead bait, use the following hook.

Let the shank be about six inches long, and leaded from the middle as low as the bent of the hook, to which a piece of very strong gimp must be fastened by a staple, and two links of chain, the shank must be barbed like a dart, and the lead a quarter of an inch square the barb of the shank must stand like the fluke of an anchor, which is placed in a contrary direction to that of the stock, see fig. 6. Let the gimp be about a foot long, and to the end fix a swivel to bait it, thrust the barb of the shank into the mouth of the bait-fish, and bring it out at the side near the tail when the barb is thus brought through, it cannot return, and the fish will lie perfectly straight, a circumstance that renders the trouble of tying the tail unnecessary.

There is yet another sort of trolling-hook, which is, either single or double, with a long shank, leaded about three inches up the wire with a piece of lead about a quarter of an inch square at the greater or lower end, fix to the shank an aimed wire about eight inches long to bait this hook thrust your wire into the mouth of the fish, quite through his belly, and

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out at his tail, placing the wire so as that the point of the hook may be even with the belly of the bait fish, and then tie the tail of the fish with strong thread, to the wire, some faster, it with a needle and thread, which is a neater way.

Both with the troll and at the snap, cut away one of the fins of the bait-fish close at the gills, and another behind the vent on the contrary side, which will make it ply the better.

The bait, being thus fixed, is to be thrown into and kept in constant motion in the water, sometimes suffered to sink, then gradually raised, now drawn with the stream, and then against it, so as to counterfeits the motion of a small fish in swimming. If a pike be near, he mistakes the bait for a living fish, seizes it with prodigious greediness, goes off with it to his hold, and in about ten minutes pouches it. When he has thus swallowed the bait, you will see the line move, which is the signal for striking him, do this with two powerful jerks, and then play him.

The other way of taking pike, viz with the snap, is as follows.

Let the rod be twelve feet long, very strong and taper, with a strong loop at the top to fasten your line to, your line must be about a foot shorter than the rod, and much stronger than the trolling line.

And here it is necessary to be remembered, that there are two ways of snapping for pike, viz with the live and with the dead snap. For the former, there is no kind of hook so proper as the double spring hook, a double form of which is given in the plates, fig 7 and 8. To bait it, nothing more is necessary than to hang the bait fish fast by the back fin to the middle hook, where he will live a long time.

Of hooks for the dead snap there are many kinds. Fig 9 of plate XC is a representation of one, which, after repeated trials, has been found to excel all others hitherto known, the description and use of it is as follows, viz Whip two hooks, of about three eighths of an inch in the bent, to a piece of gimp, in the manner directed for the trolling-hook, a view of which is given in the plate, fig 5. Then take a piece of lead, of the same size and figure as directed for the trolling hook, and drill a hole through it from end to end to bait it, take a long needle, or wire, enter it in at the side, about half an inch above the tail, and with it pass the gimp between the skin and the ribs of the fish, bring it out at its mouth, then put the lead over the gimp, draw it down into the fish's throat, and press his mouth close, and then, having a swivel to your line, hang on the gimp.

In throwing the bait, observe the rules given for trolling, but remember that the more you keep it in motion, the nearer it resembles a living fish.

When you have a bite, strike immediately the contrary way to that which the head of the pike lies, or to which he goes with the bait, if you cannot find which way his head lies,

strike upright with two smart jerks, retiring backwards as fast as you can, till you have brought him to a landing-place, and then do as before directed.

As the pike spawns in March, and before that month rivers are seldom in order for fishing, it will hardly be worth while to begin trolling till April; afterwards, however, the weeds will be apt to be troublesome. But the prime month in the year for trolling is October, when the pike is fattened by the summer's feed, the weeds are rotted, and by the falling of the waters the harbours of the fish are easily found.

Prefer to troll in clear, and not muddy water, and in windy weather if the wind be not easterly.

Some use in trolling and snapping two or more swivels to their line, by means of which the twisting of the line is prevented, the bait plays more freely, and, though dead, is made to appear as if alive, which in rivers is doubtless an excellent method: but those who like to fish in ponds or still waters, will find very little occasion for more than one.

The pike is also to be caught with a minnow, for which method take the following directions.

Get a single hook, slender, and long in the shank: let it resemble the shape of a shepherd's crook, put lead upon it, is thick near the bent as will go into the minnow's mouth, place the point of the hook directly up the face of the fish, let the rod be as long as you can handsomely manage with a line of the same length, cast up and down, and treat it as when you troll with any other bait: if when the pike has taken your bait, he run to the end of the line before he hath gorged it, do not strike, but hold still only, and he will return back and swallow it. This bait is admirable for a troll.

In landing a pike great caution is necessary for his bite is esteemed venomous, the best and safest hold you can take of him is by the head, in doing which, place your thumb and finger in his eyes.

If you go any great distance from home, you will find it necessary to carry with you many more things than are here enumerated, most of which however, may be very well contained in a wicker pannier of about twelve inches wide, and eight high, and put into a hawking bag, of the form of fig 10. The following is a list of the most material ingredients. A rod with a spare top, lines coiled up and neatly laid in round flat boxes, spare links, single hairs, waxed thread, and silk, plummetts of various sizes, of the form of fig 11 floats of all kinds, and spare caps worn-brigs, and a gentle box, see fig 12, hooks of all sizes, some whipped two single hairs, shot, shoemaker's wax, in a very small gallipot covered with a bit of leather, a clearing ring, tied to about six yards of strong cord, of the shape of fig 13 the use of which is to disengage your hook when it has caught a weed, &c. in which

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else take the butt off your rod, and slip the ring over the remaining joints, and holding it by the cord, let it gently fall, a finding net, whose hoop must be of iron, and made with joints to fold, in the shape of fig 14 and a socket to hold a staff, fig 15. Take with you also such baits as you intend to use. That you may keep your fish alive, be provided with a small hoop net to draw close to the top, and never be without a sharp knife and a pair of scissors, and if you mean to use the artificial fly, have your fly book always with you.

And for the more convenient keeping and carriage of lines, links, single hairs, &c. take a piece of parchment or vellum, seven inches by ten on the longer sides cut off four inches, and then fold it cross-wise, so as to leave a slip of two inches, of which hereafter, then take eight or ten pieces of parchment, of seven inches by four put them into the parchment or vellum so folded and sew up the ends, then cut the flap rounding and fold it down like a pocket-book, lastly, bind the ends and round the flap with red tape.

Having several of these cases, you may fill them with lines &c. proper for every kind of fishing, always remembering to put into each of them a gorgier, or small piece of cane, of five inches long, and a quarter of an inch wide, with a notch at each end, with this, when a fish has gorged your hook, you may, by putting it down his throat till you feel the hook, and holding the line tight while you press it down, easily disengage it.

If you chance to break your rod proceed as follows to mend it cut the two broken ends with a long slope so that they fit neatly together, then spread some wax very thin on each slope, and with waxed thread or silk, according to the size of the broken part requires, bind them very neatly together to fasten off lay the fore-finger of your left hand over the binding, and with your right, make four turns of the thread over it, then pass the end of your thread between the under side of your finger and rod, and draw your finger away lastly, with the fore finger and thumb of your right hand, take hold of the first of the turns, and gathering as much of it as you can, bind on till the three remaining turns are wound off, and then take hold of the end, which you had before put through, and draw close: see fig 16; 17.

For whipping on a hook take the following directions. Place the hook betwixt the fore finger and thumb of your left hand, and, with your right, give the waxed silk three or four turns round the shank of the hook then lay the end of the hair on the inside of the shank, and with your right hand whip down, as in fig 18, when you are within four turns of the bent of the hook, take the shank between the fore finger and thumb of your left hand, and place the end of the silk close by it, holding them both tight, and leaving the end to hang down, then draw the other part of the silk into a large loop, and, with your right hand

turning backwards, as in fig 19 continue the whipping for four turns, and draw the end of the silk, which has all this while hung down under the root of your left thumb, close, and twitch it off.

To tie a water knot, lay the end of one of your hairs about five inches, or less, over that of the other, and through the loop, which you would make to tie them in the common way, pass the long and the short end of the hairs, which will lie to the right of the loop, twice, and wetting the knot with your tongue, draw it close, and cut off the spare hair see fig 20.

The straw-worm, or ruff-coat, is the most common of any, and is found in the river Colne, near Uxbridge, the New River, near London, the Wandle, which runs through Carshalton in Surry, and in most other rivers.

To preserve caddis, grasshoppers, caterpillars, oak-worms, or natural flies, the following is an excellent method: cut a round bough of fine green bark withy, about the thickness of one's arm, and taking off the bark about a foot in length, turn both ends together, into the form of a hoop, and fasten them with a pack-needle and thread, then stop up the bottom with a bung-cork into this put your baits, tie it over with a colewort-leaf, and with a red-hot wire bore the bark full of holes, see fig 21, pl XCI and lay it in the grass every night, in this manner caddis may be kept till they turn to flies. To grasshoppers you may put grass.

One of the insects last described was found in the river Wandle in Surry, it was put into a small box, with sand in the bottom, and was wetted five or six times a-day, for five days, at the end of which, it produced a fine large fly, nearly of the shape of, but less than, a common white-butterfly, with two pair of cloak wings, and of a light cinnamon colour.

For your float, in slow streams, a neat round goose quill is proper, but for deep or rapid rivers, or in an eddy, the cork, shaped like a pear, is indisputably the best, which should not, in general, exceed the size of a nutmeg, let not the quill, which you put through it, be more than half an inch above and below the cork, and this float, though some prefer a swan's quill, has great advantage over a bare quill, for the quill, being defended from the water by the cork, does not soften, while the cork enables you to lead your line so heavily, as that the hook sinks almost as soon as you put it into the water, whereas when you lead but lightly, it does not get to the bottom till it is near the end of your swim. See the form of the float, pl XCI fig 27 and in leading your line, be careful to balance them so nicely, that a very small touch will sink them, some use for this purpose lead shaped like a barley-corn, but there is nothing better to lead with than shot, which you must have ready cleft always with you, remembering, that when you fish fine, it is better to have on your line a great number of small than a few large shot.

Whip the end of the quill round the plug

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with fine silk, well waxed, this will keep the water out of your float, and preserve it greatly.

In fishing with a float, your line must be about a foot shorter than your rod, for if it be longer, you cannot so well command your hook when you come to disengage the fish.

**PERCH** and **CHUB** are caught with a float, and also **GUDGEONS**, and sometimes **BARBEL** and **GRAYLING**.

For **CARP** and **TENCH**, which are seldom caught but in ponds, use a very small goose or a duck-quill float, and throw in every now and then a bit of chewed bread.

Some choose to make their own **LINES**, in which case, if they prefer those twisted with the fingers, they need only observe the rules given in the article for that purpose: but for greater neatness and expedition an engine is preferable, which is to be had at almost any fishing-tackle shop in London: it consists of a large horizontal wheel, and three very small ones, inclosed in a brass box about a quarter of an inch thick, and two inches in diameter: the axis of each of the small wheels is continued through the under side of the box, and is formed into a hook, by means of a strong screw it may be fixed in any post or partition, and is set in motion by a small winch in the centre of the box.

To twist links with this engine, take as many hairs as you intend each shall consist of, and, dividing them into three parts, tie each parcel to a bit of fine twine, about six inches long, doubled, and put through the hooks: then take a piece of lead, of a conical figure, two inches high, and two in diameter at the base, with a hook at the apex, or point: tie your three parcels of hair into one knot, and to this by the hook hang the weight.

Lastly, take a quart or larger bottle cork, and cut into the sides, at equal distance, three grooves, and placing it so as to receive each division of hair, begin to twist: you will find the link begin to twist with great ease: as the lead, as it grows tighter, shift the cork a little upwards, and when the whole is sufficiently twisted, take out the cork, and tie the link into a knot, and so proceed till you have twisted links sufficient for your line, observing to lessen the number of hairs in each link in such proportion as that the line may be taper. See the engine, pl. XI fig. 28, 29 is the form of the cork.

When you use the fly, you will find it necessary to continue your line to a greater degree of fineness, in order to which supposing the line to be eight yards in length, ask for a piece of three or four twisted links tapering, till it become of the size of a fine grass, and to the end of this fix your hook-line, which should be either of very fine grass, or silk worm gut. A weeks practice will enable a learner to throw one of these links, and he may lengthen it, by a yard at a time, till the greater end, till he can throw fifteen yards neatly: till when he is to reckon himself but a novice.

As to the colour, be determined by that of the river you fish in, but a line of the colour of pepper and salt, when mixed, will suit any water.

Many inconveniences attend the use of twisted hairs for your hook line, silk-worm gut is both fine and very strong, but then it is apt to fray, though this may in some measure be prevented by waxing it well.

Indian or sea grass makes excellent hook-lines, and though some object to it as being apt to grow brittle, and to kink in using, with proper management it is the best material for the purpose yet known, especially if ordered in the following manner.

Take as many of the finest you can get as you please, put them into a vessel, and pour thereon the scummed fat of a pot wherein fresh lard by no means silt meat has been boiled, when they have lain three or four hours take them out one by one, and strip the grease off with your finger and thumb, but do not wipe them, stretch each grass as long as it will yield, coil them up in rings, and lay them by: and you will find them become nearly as smooth, full, and round, and much stronger than the best single hairs you can get. To preserve them moist, keep them in a piece of bladder well oiled, and before you use them let them soak about half an hour in water: or, in your walk to the river side, put a length of it into your mouth.

If your grass be coarse, it will fall heavily in the water, and scare away the fish: on which account, as it has the advantage. But still if your grass be fine and round, it is the best that you can use.

Supposing you would make the plain hook or crop hook, which are terms of the same import, the method of doing it is as follows.

Hold your hook in a horizontal position, with the shank downward, and the bent of it between the fore finger and thumb of your left hand: and having a fine buttle and old cruet lying by you, take half a yard or fine red marking silk, well waxed, and, with your right hand, give it four or five turns round the shank of the hook, inclining the turns to the right hand, when you are near the end of the shank, turn into such a loop for fastening off, and draw it tight, leaving the ends of the silk to hang down at each end of the hook. Having ringed the end of your bristle, lay it along on the inside of the shank of the hook, as low as the bent, and whip four or five times round then singeing the other end of the bristle to a fit length, turn it over to the back of the shank, and, pinching it into a proper form, whip down and fasten off, as before directed, which will bring both ends of the silk into the bent. After you have waxed your silk again, take three or four strands of an ostrich feather, and holding them, and the bent of the hook as at first directed, the feathers to your left hand, and the roots in the bent of your hook, with that end of the silk you just now waxed, whip them three or four times round, and fasten off: then

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turning the feathers to the right, and twisting them and the silk with your fore finger and thumb, wind them round the shank of the hook, still supplying the short strands with new ones, as you feel, till you come to the end, and fasten off. When you have so done, clip off the palmer small at the extremities, and pull in the middle, and wax both ends of your silk, which are now divided, and lie at either end of the hook.

Lay your work by, and taking a strong bold hackle, with fibres about half an inch long, straighten the stem very carefully, and holding the small end between the fore finger and thumb of your left-hand with those of the right stroke the fibres the contrary way to that which they naturally lie - and taking the hook, and holding it as before, lay the point of the hackle into the bent of the hook, with the hollow - which is the palest side, upwards and whip it very fast to its place, in doing which be careful not to tie in many of the fibre - or if you should chance to do so - pick them out with the point of a very large needle.

When the hackle is thus made fast, the utmost care and nicety is necessary in winding it on - for if you fail in this, your fly is spoiled, in which you must begin all again - to prevent which, holding the hollow or pale side to your left hand, and, as much as possible, the side of the stem down on the dubbing - wind the hackle twice round, and holding fast what you have so wound, pick out the loose fibres - which you may have taken in, and make another turn - then lay hold of the hackle with the right hand - your fourth finger is of your left hand - and you may extend it while you do this - the loose fibres is before.

In this manner proceed till you finish in eighth of an inch of the stem, where you will find an entor - all being guided by which time you will find the fibres at the end of the hackle somewhat discoloured, clip these off close to the stem - and, with the end of your middle finger - press the stem close to the hook, while, with the fore finger of your right-hand you turn the silk into a loop - which when you have twice put over the end of the shank of the hook, loop, and all your work is safe.

Then wax that end of the silk which you now used, and turn it over as before, till you have taken up nearly all that remained of the hook, observing to lay the turns neatly side by side, and lastly, clip off the ends of the silk - thus will you have made a bait that will catch trout of the largest size in any water in England.

And lest the method of fastening off, which occurs so often in this kind of work, should not appear sufficiently intelligible, the reader will see it represented in pl. XCI fig. 30.

It is true, the method above described will require some variations in the case of gold and silver-twist palmers, in the making of which, the management of the twist is to be considered as another operation - but this variation will suggest itself to every reader, as will also the

method of making those flies that have hackle under the wings.

As the foregoing directions mention only the materials for making the several flies, the reader may yet be at a loss both with respect to their form and size, on which account, in plate XCI we have given the five, which may be considered as radical flies, they are, the palmer, pl. XCI fig. 22 the green-drake, 23 the dun-cut, 24 the hawthorn-fly, 25 and the ant fly, 26. The two first are distinct species, the third is a horned fly, the fourth has hackle under its wings - and the fifth, as most flies of the ant-kind have, has a large bottle-tail, and to one or other of these figures, it is imagined, all flies are reducible.

In adapting their different sizes, it must be owned there is great difficulty, all that can be said is - that the figures 22 and 23 exhibit the usual size of the palmer - the green and grey drake - 24 25, may serve as a specimen for most flies that are not directed to be made large, and when directions are given to make the fly small, the reader is to consider fig. 26 as an example.

Gnats cannot be made too small.

Some, in making a fly, work it upon, and fasten it immediately to, the hook-link, whether it be of gut, grass, or hair - others whip on the shank of the hook a stiff hog's bristle bent into a hook - concerning these methods there are different opinions.

The latter, however, except for small flies, seems the more eligible way, and has this advantage - that it enables you to keep your eyes close to the work - to do which, string each process separately through the loops, upon a line piece of paper, of about seven inches long - fasten it, by the one end, through a large needle, every inch in a sheet of parchment, with the name of the fly written on it, tie the other end to a ring, and lay them in round flat boxes, with paper between each ring, and when you use them, having a neat loop at the lower end of your hook-line, you may put them on and take them off at pleasure.

In the other method we are troubled with a great length of hook-link, which, if we put but few flies together, is sure to entangle, and occasion great trouble and loss of time. And as to an objection which some make to a loop, that the fish sees it, and therefore will not take the fly, there is nothing whatever in it. See further upon this subject, **GROUND ANGLING** **GROUND BAIT**, **GROUND FLUMING**.

When you have hooked a fish, never suffer him to run out with the line, but keep your rod bent, and as near perpendicular as you can by this method the top plies to every pull he makes, and you prevent the straining of your line - for the same reason,

Never raise a large fish out of the water by taking the hair to which your hook is fastened, or indeed any part of the line, into your hand - but either put a landing net under him, or, for want of that, your hat - you may indeed, in fly-fishing, lay hold of your line to draw a fish to you, but this must be done with caution.

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Your silk for whipping hooks and other fine work must be very small, use it double, and wax it, and indeed any other kind of binding, with shoemaker's wax, which of all waxes is the toughest, and holds best if your wax be too stiff, temper it with tallow

If for strong fishing you use grass, which, when you can get it fine, is to be preferred to gut, remember always to soak it about an hour in water this will make it tough, and prevent its kinking

Whenever you begin to fish, wet the end of the joints of your rod, which, as it makes them swell, will prevent their loosening And, if you happen with rain or otherwise to wet your rod, so that you cannot pull the joints asunder, turn the ferrule a few times round in the flame of a candle, and they will easily separate

Before you fix the loop of bristle to your hook, in order to make a fly, to prevent its drawing, singe the ends of it in the flame of a candle, do the same by the hair, to which at any time you whip a hook

Be always neat in your tackle, and provided with plummetts, a knife, different kinds of hooks, floats, and a few shots, or any thing else you ought to be furnished with, before you set out for your recreation

In a pond it is best to angle near the ford where the cattle go to drink, and in rivers in such places where such sort of fish you intend to angle for usually frequent for breams, try in the deepest and quietest parts of the river, for eels, under over-hanging banks, for chub, in deep shaded holes, for perch, in scowers, for roach, in the same place as perch, for trouts, in quick streams, and with a fly upon the stream on the top of the water And if you fish in such places where you can discern the gravelly bottom, conceal yourself as much as possible

In such waters as are pestered with weeds, roots of trees, and such like, fish lie close and warm, and they resort thither in great shoals, and there they will bite freely, but take great care how you cast in the hook, and how you strike a bite, for the least rashness loses hook and line

And as the hook may happen to be entangled, be provided with a ring of lead, about six inches round, fastened to a small pack-thread and in such case thrust the ring over the rod, letting it go into the water, holding fast by the other end of the pack-thread, and work it gently up and down, and it will soon disengage the hook

It is good angling in whirlpools, under bridges, at the falls of mills, and in any place where the water is deep and clear, and not disturbed with wind or weather

The best times are from April to October, for in cold, stormy and windy weather, the fish will not bite, and the best times in the day are from three till nine in the morning, and from three in the afternoon till sun-set

If the wind be easterly, it will be in vain to go to angle, but you may angle well enough if it blow from any other point, provided it do

not blow hard, but it is best in a southerly wind, and a close, lowering, warm day, with a gentle breeze, and after a sudden shower to disturb the water, at which time the fish will best rise at the fly, and bite eagerly, and the cooler the weather is in the hottest month, the better it is

In winter all weathers and all times are much alike, only the warmest are the best

It is very good angling a little before fishes spawn, for then, their bellies being full, they frequent sandy fords to rub and loosen them, at which time they will bite freely

It is also very good angling in a dull, cloudy day, after a clear moon shiny night, for in such nights they are fearful to stir to get food, lying close, so that being hungry the next day they will bite boldly and eagerly

At the opening of sluices and mill-dams, if you go with the course of the water you can hardly miss of fishes that swim up the stream to seek for what food the water brings down with it

It is good angling at the ebb, in waters that ebb and flow, but yet the flood is to be preferred, if the tide be not strong For other directions, see article FISHING

To know at any time what bait fishes are willing to take, open the belly of the first you catch, and take out his stomach very tenderly, using a sharp pen knife, and you will discover what he then feeds on The procuring proper baits is not the least part of the angler's skill

The ant fly is to be met with from June to September, and may be kept in a bottle with some earth and the roots of grass from the ant-hills where they are bred They are excellent bait for roach, dace, and chub, if you angle with them under the water about a hand's breadth from the bottom

Every angler has his peculiar haunt Into such place, in order to draw together fishes into such a place, it will be proper once in four or five days to cast in some corn boiled soft, or garbage, or worms chopt to pieces, or grains steeped in blood and dried but for carp and tench, ground malt is the most proper

If you fish in a stream, it will be best to cast in the grain above the hook, down the stream

The best way of angling with the fly is down the river, not up, and in order to obtain a free bite, use such baits as your fish is naturally inclined to, and in such manner as he is accustomed to receive them

If your baits be of paste, for the keeping them on your hook, add a little flax, or wool

The eyes of fishes are good baits for all fish Angling by hand, is of three sorts The first is performed with a line about half the length of the rod, a good weighty plummet, and three hairs next the hook, which is called a running line, and with one large brandling, or a dew-worm of a moderate size, or two small ones of the first, or any other sort proper for a trout, or indeed almost any worm whatsoever for if a trout be in humour to bite, he will bite at any worm If you fish with two, bait your hook thus

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First, run the point of your hook in at the <sup>\*</sup>ery head of your first worm, and down through his body, till it be past the knot, and then let it out, and strip the worm above the arming, (that you may not bruise it with your fingers) till you have put on the other, by running the point of your hook in below the knot, and upwards through the body, towards his head, till it be just covered with the head, which being done, you are then to slip the first worm down over the arming again, till the knot of both worms meet together.

The second way of angling in hand, and with a running lure, is with a line something longer than the former, and with tackle made after the following manner.

At the utmost extremity of your line, where the hook is always placed in all other ways of angling, you are to have a large pistol or carbine bullet, into which the end of your line is to be fastened with a peg or pin even and close with the bullet, and about half a foot above that, a branch of line of two or three handfuls long, or more, for a swift stream, with a hook at the end thereof, baited with some of the above mentioned worms, and another half a foot above that, armed and baited after the same manner, but with another sort of worms, without any lead at all above, by which means you will always certainly find the true bottom in all depths, which with the plummet upon your line above you can never do, your bait always drawing while you are sounding, (which in this way of angling must be continually) by which means you are likely to have more trouble, and much less success. And both these ways of angling at the bottom are most proper for a dark and muddy water, since in such a condition of the stream a man may stand as near as he will, and neither his own shadow nor the nearness of the tackle will hinder his sport.

The third way of angling by hand with a ground bait, and much the best of all, is with a line full as long, or a yard longer, than your rod, with no more than one hair next the hook and for two or three lengths above it, and no more than one small pellet of shot for a plummet, your hook little, your worm of the smallest brandlings, very well scoured, and only one upon the hook at a time, which is thus to be baited. The point of the hook is to be put in at the tag of his tail, and run up his body quite over all the arming, and still strip on an inch, at least, upon the hair, the head and remaining part hanging downwards, and with this line and hook thus baited, you are ever to angle in the streams, always in a clear rather than a troubled water, and always up the river, still casting out your worm before you, with a clean, light, one-handed rod, like an artificial fly, where it will be taken sometimes at the top, or within a very little of the superficies of the water, and almost always before the light plumb can sink it to the bottom, as well on account of the stream, as that you must always keep your worm in motion, by drawing it still

back towards you, as if you were angling with a fly.

<sup>\*</sup> Whoever will try this method will find it the best of all others, in a bright water especially, but then his rod must be very light and pliant, and very true and finely made, in which case, with a skilful hand it will succeed beyond expectation, and in a clear stream is undoubtedly the best worm angling for a trout or grayling that any man can make choice of, and the most easy and pleasant to him. And if the angler be of a constitution that will suffer him to wade, and will slip into the tail of a shallow stream to the calf of the leg, or knee, and so keep off the bank, he may take almost any fishes he pleases.

The second way of angling at the bottom is with a cork, or float, and that is also of two sorts. With a worm, or with grub, or caddis.

With a worm, you are to have your line within a foot or a foot and a half as long as your rod, in a dark water, with two, or, if you will, with three, but in a clear water, never with above one hair next the hook, and two, or three or four, or five lengths above it, and a worm of what size you please, your plumb fitted to your cork, and your cork to the condition of the river, (that is, to the swiftness or slowness of the stream) and both, when the water is very clear, as fine as you can, and then you are never to bait with more than one of the smaller sorts of brandlings, or if they be very little indeed, you may bait with two, as before directed.

When you angle for a **TROUT**, you are to do it as deep, that is, as near to the bottom, as you can, provided your bait do not drag, and if it do, a trout will sometimes take it in that posture. If for a grayling, you are to fish further from the bottom, this fish usually swimming nearer the middle of the water and lying always loose. With a grub or caddis you are to angle with the same length of line, or if it be quite as long as your rod it is not the worse, with never above one hair for two or three lengths next the hook, and with the smallest cork, or float, and the least weight of plumb, that the swiftness of your stream will allow, you may also avoid the violence of the current, by angling in the returns of a stream, or the eddies betwixt two streams, which indeed are the most likely places wherein to kill a fish in a stream, either at the top or bottom.

Of grubs for a **GRAYLING**, the ash grub, which is plump, milk-white, bent round from head to tail, and exceedingly tender, with a red head, or the dock-worm, or the grub of a pale yellow, longer, lankier, and tougher than the other, with rows of feet all down his belly, and a red head are the best, i. e. for a grayling, because though a trout will take both these, (the ash grub especially) yet he does not do it so freely as the other, and some say they have usually taken two graylings for one trout with this bait, but if they happen to take a trout with it, it was commonly a very good one.



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These baits are usually kept in bran, in which an ash grub commonly grows tougher, and will better endure butting, though he is still so tender that it will be necessary to warp in a piece of stiff hair with your arming, leaving it standing out about a straw's breadth at the head of your hook, so as to keep the grub either from slipping totally off when baited, or at least down to the point of the hook, by which means your arming will be left naked and bare, which is neither so sightly, nor so likely to be taken, though to help that (which will often, however, fall out) you may arm the hook designed for this bait with the whitest horse hair you can get, which itself will resemble and shine like the bait, and consequently will do more good, or less harm, than arming of any other colour.

These grubs are to be baited thus. The hook is to be put in, under the head, or the chaps of the bait, and guided down the middle of the belly, without suffering it to peep out by the way, for then (the ash grub especially) will issue out water and milk, till nothing but the skin remain, and the bend of the hook will appear black through it, till the point of the hook come so low that the heart of your bait may rest, and stick upon the hair that stands out to hold it, by which means it can neither slip of itself, neither will the force of the stream, nor quick pulling out, upon any mistake, strip it off.

Now the caddies or cob bait (which is a sure killing bait, and for the most part surer than any of the others) may be put upon the hook two or three together, and is sometimes (to very great effect) joined to a worm, and sometimes to an artificial fly, to cover the point of the hook but is always to be rigged with at bottom (when by itself especially) with the finest tackle, and is for all times in the year, the most holding bait of any, both for trout and grayling. See FISHES, and FISHING STREAMS.

Private fisheries are protected by the legislature with peculiar care and the laws upon this subject are so numerous and so dispersed, and at the same time so severe, that the reader may perhaps often find it convenient to resort to the following summary of them.

By the 5th Elizabeth, c. xxi s. 2 it is provided, that if any person shall unlawfully break or destroy any head or dam of a fish pond, or shall wrongfully fish therein, with intent to take or kill fish, he shall, on conviction at the assizes or sessions, at the suit of the king, or the party injured, be imprisoned three months, and pay treble damages, and after the expiration of the said three months, shall find surtices for good behaviour for seven years to come.

By 31st Henry Eighth, c. ii s. 2, If any evil-disposed persons shall fish in the day-time, from six in the morning till six in the evening, in any ponds, stews, or moats, with nets, hooks, or bait, against the will of the owners, they shall, on conviction thereof, at the suit of the king, or the party aggrieved, suffer im-

prisonment for the space of three months, and find security for their good behaviour.

By 22d and 23d Charles Second, c. xxv s. 7, it is enacted, That if any person shall, at any time, use any casting-net, drag net, shove-net, or other net whatever, or any angle, hair, noose, troll, or spear, or shall lay any weirs, pots, nets, fish-hooks, or other engines, or shall take any fish by any means whatsoever, in any river, stew, moat, pond, or other water, or shall be aiding therunto, without the consent of the owner of the water, and be convicted thereof before a justice, by confession, or the oath of one witness, within one month after the offence committed, such offender shall give to the party injured such satisfaction as the justice shall appoint, not exceeding treble damages, and shall, over and above, pay down presently unto the overseers of the poor, such sum, not exceeding 10s. as the justice shall think fit and in default of payment the said penalties to be levied by distress, and for want thereof, the offender to be committed to the house of correction, for a term not exceeding one month, unless the party offending enter into a bond, with surety to the party injured, in a sum not exceeding 10l. never to offend in like manner.

Justices are also authorized to take, cut in pieces, and destroy, all such articles as before recited and adapted to the taking of fish, as may be found in the possession of offenders when taken. Persons aggrieved may appeal to the quarter sessions, whose judgment shall be final. And by the 4th and 5th William and Mary, it is enacted, That no person (except makers and sellers of nets, owners of a river or fishery, authorized fishermen, and their apprentices) shall keep any net, angle, leap, pike, or other engine for taking of fish.

The proprietor of any river or fishery, or persons by them authorized, may seize, and keep to his own use, any engine which shall be found in the custody of any person fishing in any river or fishery, without the consent of the owner or occupier. And such owner, occupier, or person authorized by either, sanctioned by the consent of any justice, in the day-time, may search the houses, or other places, of any unqualified person who shall be suspected of having such nets, or other engines in his possession, and the same to seize, and keep to their own use, or cut in pieces and destroy.

By the 5th George Third, c. xiv s. 1, it is enacted, That if any person shall enter into any park or paddock inclosed, or enter into any garden, orchard, or yard, belonging to, or adjoining to, any dwelling-house, wherein shall be any river, pond, moat, or other water, and, by any means whatsoever (without the consent of the owner,) steal, kill, or destroy, any fish, bird, kept, or preserved therein, or shall be assisting therein, or shall receive or buy any such fish, knowing them to be such, shall, upon conviction, be transported for seven years. Persons making confession of such offence, and

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giving evidence against an accomplice, who, in pursuance thereof, shall be convicted, will be entitled to a free pardon

And by the same act, s 3, it is enacted, That if any person shall take, kill, or destroy, or attempt to take, kill, or destroy, any fish in any river or stream, pool, pond, or other water, (not being in any park or paddock enclosed, or in any garden, orchard, or yard, belonging or adjoining to a dwelling-house, but in any other enclosed ground, being private property,) such person being thereof convicted by confession, or the oath of one witness before a justice, shall forfeit five pounds to the owner of the fishery of such river or other water, and in default thereof, shall be committed to the house of correction for a time not exceeding six months

Stealing fish in disguise is made felony by the 9th George the First, c xxii If any person armed and disguised, shall unlawfully steal, or take away any fish, out of any river, or pond, or (whether armed or not) shall unlawfully and maliciously break down the head or pound of any fish pond, whereby the fish shall be lost and destroyed, or shall rescue any person in custody for any such offence, or procure any other to join him therein he shall be guilty of felony without benefit of clergy

ANGLO-CALVINISIS, the Calvinists of the church of England

ANGLO-SAXON, an appellation given to the language spoken by the English Saxons, in contradistinction from the true Saxon, as well as from the modern English

ANGLO-SAXON VERSIONS of the New Testament are extant in MS and a copious account given of them in The Long's Bibliotheca Sacra

ANGOLA, a kingdom of Congo, in Africa The soil is fruitful, producing Indian corn, beans, oranges, lemons, and several other fruits The inhabitants are, in general, idolaters The Portuguese have several colonies and settlements on the coast The English and Dutch, however, trade with the natives, and purchase great many slaves

ANGONE (*angoni* from *angere*, to strangle) A nervous sort of quinsy or hysteric suffocation, in which the fauces are contracted or stopped up without inflammation Globus hystericus hysteric angina

ANGORA, or ANGOURA, a city of Natolia, in Asiatic Turkey, anciently called Ancyra It was made the metropolis of Galatia, in the reign of Nero It is the seat of a Greek archbishop, and remarkable for the antiquities which remain in it This city is governed by a pasha and cadî Some have computed that there are 100,000 inhabitants, 90,000 of which are Turks, and about 1000 of these are janizaries the Christians, Greeks, and Armenians, are about 10,000 in number The finest goats in the world are bred at this place, their hair is of a fine white, almost like silk, which the inhabitants work into camblet, &c In the neighbourhood of this town, Pompey obtained a memorable victory over Mithridates, and

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Tamerlane defeated Bajazet, emperor of the Turks Lat 39 30 N Lon 32 5 E

ANGOUR s (*angor*, Lat ) Pam (*Harvey*) ANGRA, a sea-port town of Iccreera, one of the Azores, of which it is the capital Lat 38 39 N Lon 27 7 W

ANGRIY ad (from *angry*) In an angry manner, furiously, peevishly (*Shakspeare*)

ANGRIVARI, in ancient geography, a people of Germany, situated between the Weser and the Lems and eastward reaching beyond the Weser, as far as the Cheruser, on which side they raised a rampart (*Pactus*), to the south, having the Subantes on the Ems, and on the Weser where it bends to the forest Bracms, to the west, the Ems and the confines of the Bructi and to the north, the territory of the Angrivarii lay between the Chimi and Ansibarii

ANGRY a (from *anger*) 1 Touched with anger, provoked (*Genesis*) 2 Having the appearance of anger (*Pious*) 3 Painful, inflamed, snarling (*Wise man*)

ANGUILLA, in ichthyology, a species of murena, or eel See MURÆNA

ANGUIIARIS in ichthyology, a species of silurus, that inhabits the Nile

ANGUII ORVI, in zoology, having the shape or appearance of an eel

ANGUINEAL HYPERBOIA, a name given by Newton to four of his curves of the 2d order, viz species 33, 34, 35, 36, expressed by the equation  $xy^2 + cy = -ax^3 + bx^2 + cx + d$  being hyperbolas of a serpentine figure cutting the asymptotes with contrary flexions

ANGINE VERSUS, in poetry, those which may be read backwards These are otherwise called recurrent verses Such, e g, are

Optimum jus, lex amica, vox discreta  
Discreta vox, amica lex, jus optimum

ANGUINUM OVUM, a fabulous kind of egg said to be produced by the saliva of serpents and possessed of certain magical virtues This egg appears in fact, to have been nothing more than a curious glass bead, by which the Druids imposed upon the vulgar

The following account of this egg, in the put of a Druid, is extracted from Mason's Caractacus

But tell me yet,  
From the grot of charms and spells,  
Where our matron sister dwells  
Brennus, has thy holy hand  
Sicily brought the Druid wand,  
And the potent adder-stone,  
Gender'd fore the autumnal moon,  
When in undulating twine,  
The foaming snakes prolific join,  
When they hiss, and when they bear  
Their wond'rous egg aloof in air,  
Thence before to earth it fall,  
The Druid in his hallow'd pall  
Receives the prize,  
And instant flies,  
Follow'd by the venom'd brood,  
Till he cross the crystal flood?

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**ANGUIS** Snake a genus of the class and order amphibia, serpentes thus generically distinguished scales on the belly, and scales under the tail Twenty-six species, chiefly of Asia and America The following are chiefly entitled to notice A *Scytale* Scales of the belly 240, of the tail 13 South America, and India; varies very much in its colours, generally orange with black blotches, sometimes black and white, sometimes pale rose and black, paler beneath and beautifully fasciated with bars of deep black A *Eryx* Aberdeen-snake scales of the belly 120, of the tail 130 America and England, above cinereous with three black lines the whole length, beneath lead colour with white spots A *fragilis* Blind worm Scales of the belly 135, of the tail 135 Europe and Siberia, in hollow ways, woods, paths, and among rubbish, breaks into pieces if thrown down, and the fragments will live a long time afterwards Back yellowish-ash, belly black, sides streaked with black and white, tail long, obtuse, scales small, soft, compact Colour various

**ANGUISH** *s* (from *angoisse*, Fr) Excessive pain either of mind or body (*Donne*)

**ANGUISHED** *a* (from *anguish*) Excessively pained not in use (*Donne*)

**ANGULAR** *a* (from *angle*) 1 Having angles or corners (*Brown*) 2 Consisting of an angle (*Newton*)

**ANGULAR MOTION**, is the variation in the angle described by a line, or radius, connecting a body with the centre about which it moves Thus a pendulum has an angular motion about its point of suspension, and the planets have an angular motion about the sun The angular motions of revolving bodies are as their real or absolute motions directly, and as their radii of motion inversely they are also reciprocally proportional to the periodic times

**ANGULAR STEM** (*Angulatus caulis*) Excavated or grooved longitudinally with more than two hollow angles Called triangular, &c (trigonus, &c) according to the number of these angles —obtuse-angled or acute-angled, from the measure of them

Leaves also, and pericarps, running out into angles, are named triangular, &c from the number of angles

**ANGULARITY** *s* (from *angular*) The quality of being angular

**ANGULARLY** *ad* (from *angular*) With angles or corners (*Boyle*)

**ANGULARNESS** *s* (from *angular*) The quality of being angular

**ANGULATED** *a* (from *angle*) Formed with angles or corners (*Woodward*)

**ANGULOSITY** *s* (from *angulus*) Angularity, cornered form

**ANGULOUS** *a* (from *angle*) Hooked, angular (*Glanville*)

**ANGULIA** In botany, a genus of the class and order monocœcia diandria Calyx five-lobed corol five petalled, pome inferior, two-celled, many seeded Three species natives of the West Indies

**ANGUS**, a shire of Scotland, having the

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Mernes on the North, the German Ocean on the East, the Frith of Tay on the South, and Perth and Goury on the West It is diversified with lakes and hills, and is fruitful in corn and pasture It has 99,127 inhabitants

**ANGUST** *a* (*angustus*, Lat) Narrow strait

**ANGUSTATION** *s* (from *angustus*, Lat The act of making narrow, the state of being narrowed (*Wiseman*)

**ANGUSTICLAVIA**, in antiquity, a tunica, embroidered with little purple studs, worn by the knights

**ANGUSTURA CORTEX**, (*Angustura* A bark imported from Angustura, in South America Its external appearance varies considerably The best is not fibrous, but hard compact, and of a yellowish brown colour and externally of a whitish hue When reduced into powder it resembles that of Indian rhubarb It is very generally employed as febrifuge, tonic, and adstringent In intermittents it is by many preferred to the Peruvian bark, and has been found useful in diarrhoea, dyspepsia and scrofula It is thought to be the bark of the *Bruckia antidysenterica* or *ferruginea*

**ANHALT**, a principality of Upper Saxony in Germany, having the county of Mansfeldt on the South, the duchy of Ilberstadt on the West, Saxony on the East, and Magdeburg on the North Its principal trade is in beer

**ANHALT**, an island of North Jutland in Denmark, lying in the Cattegat Being dangerous for seamen, a light-house has been erected

**ANHIMATION** *s* (*anhelo*, Lat) The act of panting, the state of being out of breath

**ANHIMOUS** (*an* I it) Out of breath, panting

**ANISOLT**, in geography an island of Denmark, situated in the Cattegat, surrounded with sandbanks and dangerous to seamen, for which reason there is a light house on it N 1 at 56 38 F Lon 11 5

**ANHIDROUS SULPHATE OF LIME** See SULPHATE

**ANIS** See CROTOI HAGI

**ANICH** (Peter), an ingenious mathematician, was the son of a labourer, at Oberpauz, near Inspruck, where he was born in 1723 His genius being discovered by Fith Hill, a jesuit, in the university of Inspruck, he became his tutor and patron In a title which Anich became an able astronomer, and ingenious mechanic He made an elegant set of globes for the university of Inspruck, and constructed various mathematical instrument He also drew maps and charts with great accuracy and neatness He died in 1766, at the empress queen, from a regard to his merits settled a pension of 50 florins a year on his sister

**ANIDROSIS** (from *an* priv and *idros*, sweat) Privation of sweat or perspiration

**ANJINGO**, a small town on the coast of Malabar, belonging to the English East-India Company Their merchandize consists chief

In pepper and calicoes. Lat 7 0 N Lon 76 1 E

**ANIGHTS** *ad* (from *a* for *at*, and *night*) In the night-time (*Shakspeare*).

**ANIGOZANTHOS** In botany, a genus of the class and order hexandria monogynia Corol six-parted, with unequal incurved segments, stamens inserted in the throat of the corol, capsule three-celled, many-seeded The only known species is a native of New Holland

**ANILENESS, ANILITY** : The old age of women

**ANIMA**, among divines and naturalists, denotes the soul, or principle of life in animals See **SOUL**

**ANIMA**, among the old chemists, denoted the volatile or spirituous parts of bodies

**ANIMA HEPATIS**, is an obsolete name for the ferrum vitriolium, or sulphate of iron, on account of its supposed efficacy in diseases of the liver

**ANIMA MUNDI**, a certain pure ethereal substance of spirit, diffused, according to many of the ancient philosophers, through the mass of the world, informing, actuating and uniting the divers parts thereof into one great, perfect, or animal, and vital body or animal They add, that this anima mundi, which more immediately resides in the celestial regions as its proper seat, moves and governs the heavens in such manner, as that the heavens themselves first receive their existence from the fecundity of the same spirit, for that this anima, being the primary source of life, every-where breathed a spirit like itself by virtue whereof various kinds of things were framed conformably to the divine ideas

**ANIMA SATURNI**, a white powder obtained by pouring distilled vinegar on litharge, of considerable use in enamelling See **ENAMEL**

**ANIMABLE** *a* (from *animate*) That may be put into life, or receive animation

**ANIMADVERSION** *v* (*animadversio*, Lat) 1 Reproof, severe censure (*Clarendon*)

2 Punishment (*Swift*)

**ANIMADVERSIVE** *a* (from *animadversio*) That has the power of judging (*Glan*)

1 **ANIMADVERSIVE** *v* *n* (*animadverso*, Lat) 1 To pass censures upon (*Dryden*) 2 To inflict punishments upon (*Græw*)

**ANIMADVERSIL** *v* (from *animadversio*) He that passes censures, or inflicts punishments (*South*)

**ANIMAL**, in natural history, an organized and living body, endowed with the powers of sensation and of voluntary loco-motion The word is derived from anima, soul, and literally denotes something that is endued with a soul

**ANIMAL** *a* (*animalis*, Lat) That belongs or relates to animals (*Watts*)

**Animal acids**, are those which have been discovered in animal substances, or which contribute to their formation These are, the acetic, the amniotic, the benzoic, the carbonic, the lactic, the malic, the muriatic the oxalic, the phosphoric, the rosacic, the sulphuric, and the uric many of them, however, are not

peculiar to animals, but are frequently found both in vegetables and minerals See **ACID**

**Animal actions** **Actiones animales** Those actions, or functions, are so termed, which are performed through the means of the mind To this class belong the external and internal senses, the voluntary action of muscles, voice, speech, watching, and sleep

**Animal economy**, the structure and uses of the different parts of the body

**Animal functions**, are those by which the materials which constitute and support the bodies of animals are prepared and supplied The principal of these functions are the following—circulation, digestion, nutrition or assimilation, respiration, and secretion, which are employed in producing animal matter from the substances which compose it But, besides these, there are others, which, though they do not act chemically, like the foregoing, are in many animals subservient to various important purposes See **IRRITABILITY**, **SENSIBILITY**, &c

**Animal heat** Heat is essentially necessary to life That of a man in health is from about 94° to 100° of Fahrenheit It appears to depend upon the absorption of oxygen in the lungs

**Animal magnetism**, a sympathy, by some persons lately supposed to exist between the magnet and the human body, by means of which the former became capable of curing many diseases in an unknown way, something resembling the performances of the old magicians

The fanciful system, to call it by no worse name of animal magnetism, appears to have originated, in 1774, from a German philosopher named father Hehl, who greatly recommended the use of the magnet in medicine M Mesmer, a physician of the same country, by adopting the principles of Hehl, became the direct founder of the system but, afterwards deviating from the tenets of his instructor, he lost his patronage, as well as that of Dr Ingenhousz, which he had formerly enjoyed Mesmer had already distinguished himself by "A dissertation on the influence of the stars upon the human body, which he publicly defended in a thesis before the university of Vienna, but he was so unable to stand before the opposition of Hehl and Ingenhousz, that his system fell almost instantly into disrepute Mesmer appealed to the academy of sciences at Berlin, but they rejected his principles as destitute of foundation, and unworthy of the smallest attention He then made a tour through Germany publishing every where the great cures he performed by means of his animal magnetism, while his enemies every where pursued him with detections of the falsehood of his assertions

Mesmer, still undaunted by so many defeats, returned to Vienna, but meeting there with no better success than before, he retired to Paris in the beginning of the year 1778 Here he met with a very different reception He

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was first patronised by the author of the *Dictionnaire des Merveilles de la Nature*, in which work a great number of his cures were published, Mesmer himself receiving likewise an ample testimony of his candour and solid reasoning. Our physician soon collected some patients, and in the month of April 1778, retired with them to Creteil, from whence he in a short time returned with them perfectly cured. His success was now as great as his disappointment had been before. Patients increased so rapidly, that the doctor was soon obliged to take in pupils, to assist him in his operations. These pupils succeeded equally well as Mesmer himself, and so well did they take care of their own emolument, that one of them, named M. Deslon, realized upwards of 100,000l sterling. In 1779 Mesmer published a memoir on the subject of animal magnetism, promising afterwards a complete work upon the same, which should make as great a revolution in philosophy as it had already done in medicine.

The principles of the art were explained by Deslon, in the following manner.

1 Animal magnetism is an universal fluid, constituting an absolute plenum in nature, and the medium of all mutual influence between the celestial bodies, and betwixt the earth and animal bodies.

2 It is the most subtle fluid in nature, capable of a flux and reflux, and of receiving, propagating, and continuing all kinds of motion.

3 The animal body is subjected to the influences of this fluid by means of the nerves, which are immediately affected by it.

4 The human body has poles and other properties analogous to the magnet.

5 The action and virtue of animal magnetism may be communicated from one body to another, whether animate or inanimate.

6 It operates at a great distance without the intervention of any body.

7 It is increased and reflected by mirrors, communicated, propagated, and increased by sound, and may be accumulated, concentrated, and transported.

8 Notwithstanding the universality of this fluid, all animal bodies are not equally affected by it, on the other hand, there are some, though but few in number, the presence of which destroys all the effects of animal magnetism.

9 By means of this fluid nervous disorders are cured immediately, and others mediately, and its virtues, in short, extend to the universal cure and preservation of mankind.

From this extraordinary theory, Mesmer fabricated a paper, in which he asserted that all diseases arise from one common source, that they may be removed by one mode of cure, and that this cure consists in the application of animal magnetism. The folly and credulity of the times soon gained partizans to this new and plausible theory: it became at length so popular and fashionable in France, that the

jealousy of the faculty was awakened, and an application was made to government. A committee, consisting of physicians and members of the Royal Academy of Sciences, of which the late illustrious Franklin was a principal member, was immediately appointed, to inquire into its merits, and to ascertain its effects. The consequence of this examination was such as might have been anticipated by every rational mind. The spell was quickly broken, and the whole disclosed to be an artful imposition on the weakness and credulity of mankind. It is now almost universally exploded, and treated with merited ridicule and contempt. The practice, however, and subsequent detection of this wild and visionary doctrine, have not been altogether useless, since to the philosopher, it has added one more to the numerous catalogue of the errors and illusions of the human understanding, and affords a memorable instance of the power of imagination. Those who wish to learn more of the history of this species of quackery, are referred to Despiau's *Select Amusements*, and to Willich's *Lectures on Diet and Regimen*.

*Animal matter.* Under this term are comprehended all the various kinds of substance, of which animal bodies are composed, not so much, however, with regard to the radical principles of which they consist, as to those particular and exclusive forms in which they exist throughout all the tribes of the animal kingdom, as far as they have been subjected to examination.

The different parts into which the bodies of animals, taken generally, may naturally be divided, are the following.

Solid 1 Bones and shells—2 Horns and nails—3 Muscles, or fleshy parts—4 Skin—5 Membranes—6 Tendons—7 Ligaments—8 Glands—9 Brain and nerves—10 Hair and feathers—11 Silk and similar bodies, and in a diseased state of body the different kinds of calculi, and the concretion in the lungs, &c.

Fluid 1 Blood, from which the following are secreted by digestion and its future processes—2 Milk—3 Yolk of egg—4 Saliva—5 Gastric juice—6 Bile—7 Cerumen—8 Tears—9 Humours of the eye—10 Mucus of the nose, &c.—11 Sinovia—12 Semen—13 Liquor of the uterus—14 Urine, and, in cases of disease, the morbid secretions of pus, liquor of the dropsy, and that from blisters.

In the composition of these parts, the following animal substances have been discovered 1 Gelatine—2 Albumen—3 Fibrin, gluten, or animal fibre—4 Mucilage—5 Urea—6 Sugar—7 Oils—8 Resins—9 Acids—10 Alkalies—11 Earths—12 Metals.

And these again are formed principally from different proportions and combinations of the following simple substances 1 Azote—2 Carbon—3 Hydrogen—4 Oxygen—5 Phosphorus—6 Lime—7 Sulphur—8 Soda—9 Potash—10 Muriatic acid—11 Magnesia—12 Silica—13 Iron—14 Manganese. The

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first six are so much more abundant than the rest, that animal matters may in general be considered as in a great measure composed of them, the first four constitute almost entirely the soft parts, and the other two form the bases of the hard parts. Magnesia and silica are only found in exceedingly small quantities, and the last only in cases of disease.

Of all the simple and compound substances mentioned above, as existing in one form or other in the different classes of animals, particular accounts will be found in the several articles of this work to which their names refer.

*Analysis of animal matter.* Among the vast variety of objects which the curiosity of man has impelled him to investigate, and about which the researches of chemistry have been employed, the substances of which animals are composed have not, till late years, been regarded with a proportionate attention. The French chemists, particularly Vauquelin, Berthollet, and Fourcroy, by deviating from the old method of analysis by fire, according to which all animal substances afforded the same results, and employing in its stead the simpler menstrua, have been enabled to discover many peculiar products of animalization. The analysis of animal matter and even of that of vegetables, is still, however, far from being perfect, and is much less complete and satisfactory than of organized substances. While, therefore, our knowledge of this subject has been greatly improved, many more discoveries, and much patient investigation, are necessary to render it subservient to many practical purposes, or to extend materially our acquaintance with the physiology of the human frame.

Animal matters are at present analysed in a very different way from that in which they were analysed a few years since. They are no longer subjected to decomposition by fire, they are now treated by re-agents particularly acids, (the most effectual of which is nitrous), alkalis, alcohol, &c. The different fluids intermingled with each other, or contained in the vesicles of the different parts, are separated by rest, decantation, filtration, or expression. The action of these substances on colouring matters is examined, and the several changes which they are liable to suffer in different temperatures are observed. Animal liquors are carefully evaporated, and the different salts which they contain extracted from them unaltered. By these methods of analysis modern chemists have made a number of important discoveries concerning animal substances. Scheele has found them to contain several acids different from those which were before known. Berthollet has demonstrated the existence of phosphoric acid, in a naked state, in urine and sweat, and has likewise found in animal matters, a remarkable quantity of the azotic principle. This last discovery is one of the most important facts which the analysis of animal matters has made known to us. The existence of azot in these substances, especially in their fibrous parts, accounts for the difference between animal and

vegetable matters. This body is obtained in the state of elastic fluidity, i. e. azotic gas, by treating the flesh of the muscles with nitric acid even without the operation of any external heat, it is disengaged in a pretty large proportion—it passes before the nitrous gas, and when the latter begins to be disengaged, the operation should be stopped, and the vessels changed. By this discovery Berthollet explains the formation of the ammonia which animal substances afford, when treated by fire—the production and disengagement of this salt by putrefaction—and the relation between these substances and vegetable matters that are liable to putrefaction, and afford ammonia by distillation. It appears, in fact, that in both these instances the ammonia is formed by the combination of hydrogen with azot (*Fourcroy*).

It has been already mentioned that fire was formerly the only agent employed in the analysis of animal and vegetable substances, which were subjected to distillation in a retort, by a heat at first gentle, and afterwards increased gradually till every part of the animal matter was volatilized, and only a fixed residue, termed *caput mortuum*, remained in the retort. By this method an important distinction was obtained between animal and vegetable matter: the latter yielded an acid liquor, and the former a urinous or volatile alkaline one, together with a concrete salt of the same nature, and an empyreumatic oil more fetid than the oils of vegetables, and of a different kind of fætor. The putrefaction of animal substances gives similar products, particularly ammonia. Another difference between these substances is remarked in the fixed residuum after distillation in close vessels: in vegetable matter this is composed principally of charcoal, and in that of animals of a large proportion of phosphoric salts, generally united with lime.

Beside the imperfection of the method of analysis by fire, it is attended with the following disadvantages—it affords an alkali (ammonia) formed by the process, and not previously contained in the substance examined—and it confounds in a few common products of distillation a variety of parts which have perfectly distinct and often opposite qualities. In the improved methods which modern chemists have introduced, a number of re-agents are employed, of which the following are the principal.

1 *Nitrous acid*, which has been more extensively useful in discovering the properties of animal matters, and their various modes of action, than any other substance. Since the nature of this acid has been explained by the ingenious researches of Priestley, Cavendish, and others, it has proved of signal use to chemists, among whom, Bergman, Berthollet, and Fourcroy, have applied it with considerable ability and success.

2 *Heat*, in various degrees and forms besides that of distillation: it is not only of advantage in separating the more fluid from the soft, and the solid matters, but occasionally contributes to increase and regulate the action of the other agents.

3 *Water*, which may often be employed with considerable advantage: its effects may be increased by the use of a Papin's digester.

4 *The caustic alkalis*, which are particularly used as a solvent for gluten and coagulated albumen, after the action of water has been exhausted.

To particularize the various processes to which these are applied, and the numerous phenomena which accompany and follow their use, would far exceed our limits: we therefore refer the curious enquirer to such works as treat more fully on the subject, especially Thomson's *Chemistry*, vol IV, Fourcroy's *Elements of Chemistry*, translated by Nicholson, vols III and IV, and his *System of Chemical Knowledge*, Rees's *Cyclopaedia*, art *Animal matter*, &c &c *Encyclopaedia Britannica*.

On comparing animal with vegetable substances, it has been found that, though the same radical principles frequently enter into the composition of both, they are distinguished by different proportions of these principles, animal matter containing much more azote and phosphorus, and vegetable more carbon, hydrogen, and oxygen.

To conclude in the words of Fourcroy: Although many experiments still remain to be performed, and many discoveries to be made, in order to complete the history of animal matters, yet our present knowledge of them is much more considerable than what was formerly possessed: the proper road is, at least, discovered, and we need no longer be afraid of wandering in a wrong direction. It now appears plainly how much the physics of animal nature may be improved by chemistry, and what important services medicine may expect from it, when the two sciences proceed hand in hand.

*Animal oil*. See *OIL*, and *OLEUM*.

*Animal putrefaction*, is that change which animal bodies undergo when deprived of life, and by which they are gradually and completely decomposed. The process by which this change is occasioned, is effected chiefly by the access of air, aided by a due degree of moisture, and of heat. The principal circumstances attending this decomposition of animal matter are the following:

Its colour first becomes pale, its consistence diminishes, its texture is relaxed, and a faint and disagreeable smell is emitted. The colour at this time changes to blue and green, the parts become more and more softened, the smell becomes fetid, and the colour of an obscure brown. The fibres now yield, the texture is more resolved, the putrid and nauseous smell is mixed with a smell of a more penetrating kind, arising from the disengagement of ammoniacal gas; after this the mass becomes of still less and less consistence, the smell more faint and nauseous, and the effluvia exceedingly offensive and injurious, arising. It has been said, from the separation of phosphated and carbonated hydrogen gas, a separation of phosphorus taking place at the same time. It has continued in this state some time,

the mass again swells up, and carbonic acid gas is separated, this part of the process is protracted for some time, when it changes into a soft putrid mass.

A great part of the hydrogen, and the remaining carbon, with the other fixed radicals, now gradually form a dark brown, soft, earthy matter. This result forms soil, which, mixed with mould, the remains of vegetable putrefaction, forms the common receptacle for the roots, and germinating seeds of vegetables.

When this resolution takes place at the same time with vegetable matter, as in marshes, some portion of the hydrogen and phosphorus produce the ignes fatui, and such luminous appearances. If this resolution is accomplished in a confined place, a foul musty smell is discoverable.

Heat, moisture, and the access of air should be avoided if it be intended to prevent this process from taking place. In one or other of these modes the various antiseptic processes act, such as covering with resins and balsams, drying, salting and smoking, immersion in spirits, freezing water, &c (*Parkinson*). See *PUTREFACTION*.

A curious instance of partial decomposition has been observed to take place in whole bodies, after burial, by which their muscular parts have been converted into a white fatty matter, resembling spermaceti. This was first remarked by the French chemists, a few years ago, in taking up some bodies which had been interred in the *Cemeterie des Innocens*, at Paris. Similar effects have been produced on the body of a duck or young goose, by lying some time in mud, and on the lean of beef placed in a river, and enclosed in a box with holes. See *ADIPOCIRE*.

*Animal system*, imports the whole class of beings endowed with animal life, in which sense it amounts to much the same as what we call the animal kingdom.

*ANIMALCULE*, *ANIMALCULUM*, a diminutive of animal, and applied in a general manner to those creatures whose true figure cannot be discerned without the help of glasses, a id more especially to such as are invisible to the naked eye.

By the help of magnifying glasses, we are brought into a kind of new world, and numberless animals are discovered, which from their minuteness must otherwise for ever have escaped our observation: and how many kinds of these invisibles there may be, is still unknown, as they are discerned of all sizes, from those which are barely invisible to the naked eye, to such as resist the action of the microscope, as the fixed stars do that of the telescope, and with the best magnifiers hitherto invented, appear only as so many moving points. The smallest living creatures our instruments can show are those that inhabit the waters: for though possibly animalcules equally minute, or perhaps more so, may fly in the air, or creep upon the earth, it is scarce possible to bring such under our examination, but water being transparent, and confining the creatures in it.



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We are able, by applying a drop of it to our microscopes, to discover, at least, to a certain extent, all that it contains

Animalcules are seen only by the assistance of microscopes, and are perhaps more numerous than any other part of the animal creation, but the species, on a close examination, are found to be but few, in proportion to the number of individuals. The most obvious distinction among them is, that some have, and others have not tails, and that some have, and others have not visible limbs. According, therefore, to these characters, they are arranged under three classes, distinguished by the names of *gymnia*, *cercaria*, *arthronia*, the first containing those which have no visible limbs, nor any tail, the second, those which have tails, the third, those which have visible limbs

Animalcules are said to be the cause of various disorders. The itch, from several experiments, is affirmed to be a disorder arising from the irritations of a species of animalcules found in the pustules of that disease, whence the communication of it by contact from one to another is easily conceived, as also the reason of the cure being effected by cutaneous applications. On this foundation, some have attributed the small-pox, measles, and other infectious diseases, and others the epilepsy, &c. to animalcules. Langius goes farther, and pretends to reduce all diseases in general to the same principle. A late writer at Paris, who assumed the title of an English physician, has done more. He not only accounts for all diseases, but for the operations of all medicines upon the hypothesis of animalcules. He had peculiar animals for every disease, scorbutic animalcules, podagric animalcules, variculous animalcules, &c. all at his service. *Journ des Sçav tom LXXXII p 535, &c* But as most discoveries in natural philosophy have laid a foundation for the warm imaginations of some men to form visionary theories, to the great prejudice of real knowledge, so those relating to animalcules have been drawn in, how ever improperly, to support the most whimsical and chimerical systems

For more on this subject the inquisitive reader may consult the papers of *Lewenhoeck*, *Baker*, &c. in the *Philosophical Transactions*, *Baker* on the Microscope, *Kanmacher* on the Microscope, &c

**ANIMALITY** *s* (from *animal*) The state of animal existence (*Watts*)

**ANIMALIZATION** The process employed by the animal machine to convert vegetable substances introduced into the stomach for the sake of nutrition, into animal matter. It is the commencement of what is denominated by physiologists assimilation, or the translation of alimentary substances, whether produced from the vegetable or animal kingdom, into such a state as renders them similar to the different organs of which they are to become a constituent part

The chief difference between vegetable and animal matters is, that the former possesses a

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great abundance of carbon, compared with its azot, and the latter a great abundance of azot compared with its proportion of carbon. These two processes, therefore, which are of a chemical nature, consist in exhausting the vegetable nutriment or saccharine matter of its surplus of carbon, and communicating an accession of azot, both which take place by the functions of respiration and perspiration

**TO ANIMATE** *v a* (*animo*, Lat) 1 To quicken, to make alive 2 To give powers to (*Dryden*) 3 To encourage; to incite (*Knolles*)

**ANIMATE** *a* (from *To animate*) Alive, possessing animal life (*Bentley*)

**ANIMATED** *particip a* (from *animate*) Lively, vigorous (*Pope*)

**ANIMATION** *s* (from *animate*) 1 The act of animating or enlivening (*Bac*) 2 The state of being enlivened (*Brown*)

**ANIMATIVE** *a* (from *animate*) That has the power of giving life

**ANIMATOR** *s* (from *animate*) That which gives life (*Brown*)

**ANIME**, or **ANIMÆ**, **GUMMI** The substance which bears this name in the shops is a resin, the produce of the *hymenæa courbaril* of Linneus. It is seldom ordered in the medical practice of the present day, and is only to be met with in the collections of the curious

**ANIME**, in heraldry, a term used when the eyes of a rapacious creature are borne of a different tincture from the creature itself

**ANIMI DELIQUIUM**, (from *animus*, the mind, and *delinquo*, to leave) Fainting, *Lipothymia* See **SYNCOPE**

**ANIMOSE** *a* (*animosus*, Lat) Full of spirit, hot, vehement

**ANIMOSITY** *s* (*animositas*, Lat) Vehemence of hatred, passionate malignity (*Sw*)

**ANIMUS** This word is to be distinguished from *anima*, the former expresses the faculty of reasoning, and the latter the being in which that faculty resides

**ANINGA**, in commerce, a root which grows in the Antilles, and is used by sugar-bakers in the refining of sugar

**ANJOU**, a late province of France. It now forms, with the late provinces of Maine and Touraine, the four departments of Maine and Loire, Indre and Loire, Maine, and Sarthe

**ANISE** See **PIMPINELLA**

**ANISE SEED** See **ILLICIUM**

**ANISUM**, (*anissum*, *ανισον*, from *a*, neg and *νισος*, equal) *Anisum vulgare* *Anise Pimpinella anisum* of Linneus *Pimpinella, foliis radicalibus trifidis incisiss* Class, pentandria order, digynia A native of Egypt Anise-seeds have an aromatic smell, and a pleasant, warm, and sweetish taste An essential oil and distilled water are prepared from them, which are employed in flatulencies and gripes, to which children are more especially subject, also in weakness of the stomach, diarrhoeas, and loss of tone in the primæ viæ

**ANISUM SINENSE** See **ANISUM STELLATUM**

**ANISUM STELLATUM** *Anisum Sinense*

## ANN

**Semen baden.** \*The plant which affords these seeds is the *illicium anisatum* of Linnéus. They are used with the same views as those of the *pimpinella anisum*. The same tree is supposed to furnish the aromatic bark called *cortex anisi stellati* or *cortex lavula*.

**ANISUM VULGARE** See **ANISUM**.

**ANKER** *s* (*ancher*, Dutch) A liquid measure, the fourth part of an awm, and contains two stekans, each stekan consists of sixteen mungles, the mungle being equal to two of our wine quarts.

**ANKLE**, joint of the, in anatomy, is made by the apposition of the astragalus, or upper bone of the foot, to the lower part of the tibia and fibula, which are, for that purpose, tied together by a strong band of ligaments both before and behind.

**ANKLE**, luxation of See **DISLOCATION** and **LUXATION**.

**ANNA**, the principal town of a province of the same name in Asiatic Turkey, seated on the western bank of the river Euphrates Lat 33 35 N Lon 41 0 E.

**ANNABERG**, a town of Germany, in the archduchy of Austria four miles E Eßfording.

**ANNABERG**, a town of Germany, in the circle of Erzeburg, and electorate of Saxony five miles SSW Wolkenstein.

**ANNABURG**, a town of Germany, in the electorate of Saxony, sixteen miles ESE Wittenburg Lon 30 40 E Ferro Lat 51 41 N.

**ANNAGH**, an island on the west coast of Ireland, about five miles in circumference, between the isle of Achil, and the main land of the county of Mayo Lon 9 39 W Greenwich Lat 53 58 N.

**ANNAGH**, a small island of Ireland, in Lough Conn, in the county of Mayo eight miles from Aillala.

**ANNALIS CLAVUS**, the nail which the prætor, consul, or dictator, drove into the wall of Jupiter's temple annually upon the ides of September, to show the number of years a similar ceremony was sometimes performed to avert the plague.

**ANNALIST** *s* A writer of annals.

**ANNALS**, a species of history, wherein events are related in the chronological order they happened.

It differs from a perfect history, in being only a mere relation of what passes every year, as a journal is of what passes everyday, whereas history relates not only the transactions themselves, but also the causes, motives, and springs of such actions. Cicero informs us that the pontifex maximus, in order to preserve the memory of events, wrote what passed each year on tablets, which were exposed to public inspection in his own house. These tablets were called *annales maximi*; hence the writers who imitated this method of writing were stiled *annalists*.

Of this opinion the great annalist, Tacitus himself, seems to have been, because the first part of his work, which treats of former times, he calls *annals*, but when he comes down to

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his own times, he changes his title, and calls it *history*.

The *Annals* of Grotius is a book finely written, and contains excellent materials. He is not so particular as Strada, but more profound, and comes much nearer to Tacitus.

**ANNAMOOKA**, one of the Friendly isles, discovered by Tasman, in 1643, and visited by captain Cook, in the years 1774 and 1777 Lat 20 05 Lon 176 W.

**ANNAN**, a borough of Annandale (a district of Dumfriesshire) in Scotland. It is seated on the river Annan, three miles north of Solway Frith Lat 55 0 N Lon 3 4 W.

**ANNAPOLIS**, a town of Maryland, North America Lat 39 0 N Lon 77 20 W.

**ANNAPOLIS**, the capital town of Nova Scotia, North America Lat 44 52 N Lon 64 5 W.

**ANNATES**, among ecclesiastical writers, a year's income of a spiritual living. These were, in ancient times, given to the pope through all Christendom upon the decease of any bishop, abbot, or parish-clerk, and were paid by his successor. At the Reformation they were taken from the pope, and vested in the king, and, finally, queen Anne restored them to the church, by appropriating them to the augmentation of poor livings.

**ANNE**, queen of Great Britain, was the second daughter of James II by lady Anne Hyde, and was born in 1664. In 1683, she married prince George of Denmark, by whom she had several children, but all of them died young. In 1702, she succeeded to the crown on the death of William III. Her reign was distinguished by great glory, and on account of the eminent literary characters which adorned it, has been called the Augustan age of Britain. But the spirit of party never, perhaps, rose higher than it did in her time. She died in 1714.

The character of this princess has been thus given by Smollett: "Her capacity was naturally good, but not much cultivated by learning, nor did she exhibit any marks of extraordinary genius, or personal ambition. She was certainly deficient in that vigour of mind by which a prince ought to preserve her independence, and avoid the snares and fetters of sycophants and favourites, but whatever her weakness in this particular might have been, the virtues of her heart were never called in question. She was a pattern of conjugal affection and fidelity, a tender mother, a warm friend, an indulgent mistress, a munificent patron, a mild and merciful princess, during whose reign no blood was shed for treason. She was zealously attached to the church of England, from conviction rather than from prepossession, unaffectedly pious, just, charitable, and compassionate. She felt a mother's fondness for her people, by whom she was universally beloved with an affection which even the prejudice of party could not abate. In a word, if she was not the greatest, she was certainly one of the best and most unblemished sovereigns that ever sat upon the throne of

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England, and well deserved the expressive, though simple epithet of, the "good queen Anne."

**ANNE BOLEYN** See **BOLEYN**

**To ANNEAL** *v a* (*alan*, Saxon) 1 To heat glass, that the colours laid on it may be fixed (*Dryden*) 2. To heat any thing in such a manner as to give it the true temper

**ANNEALING**, consists in making metals red-hot which have become hard and stiff by frequent percussion, or by a strong compression, in order to restore their former malleability and tractability. All metals have the singular property of becoming more or less hard, untractable, and unmalleable, after they have been struck some time with a hammer. It seems as if something happened to them similar to the effect produced by the tempering of steel. Metals thus affected become more elastic than before, but, at the same time, more brittle. They are more sensibly affected in this manner in proportion as they are naturally harder. Copper is so much affected, and even gold and silver, by hammering, that they soon cease to be malleable, and are apt to split and crack, instead of being extended, under the hammer. This labour, therefore, must be often interrupted, to soften and restore malleability to metals; this is effected by making them red-hot, which the workmen call annealing. Thus, heat produces the same effect on metals in the state described, as it does upon tempered steel; for, if the hardest tempered steel be made red-hot and cooled slowly, it becomes as tractable and ductile as the softest iron (*Macquer*).

Forged iron has long been procured, by placing a mass of cast iron under large hammers, and making it undergo violent and repeated compression. A process is now used for converting cast-iron into forged, by heat alone. The cast-iron is placed in an air-furnace, and kept for several hours in a degree of heat, by which it is brought near to a fluid state. It is then allowed to cool gradually, and is found to be converted into a substance similar to forged iron. This process is conducted under a patent, although, if *Reaumur's* experiments upon cast-iron be consulted, it will appear not to be a new discovery. *English Encyclopedia*

There is also an annealing for articles made of glass. It consists in placing them, while newly made, and still hot, in an oven or furnace, where they very slowly cool. This annealing for bottles and other glass utensils is quite necessary to render them serviceable, for all glass which is cooled suddenly is liable to be broken, not only by the least change of heat and cold, but even by the slightest force (*Macquer*). See **NEALING**

**To ANNE'X** *v a* (*annecto*, *annexum*, Lat) 1 To unite to at the end 2 To unite, as a smaller thing to a greater 3 To unite 2 posterior (*Raleigh*)

**ANN'EX** *s* (from *To annex*) The thing annexed, additament (*Brown*)

**ANNEXATION** *s* (from *annex*) 1 Conjunction, addition (*Hammond*) 2 Union, act of uniting (*Ayliffe*)

## A N N

**ANNEXION** *s*. (from *annex*) The act of annexing, addition (*Eggers*)

**ANNEXMENT** *s* (from *annex*.) 1. The act of annexing 2. The thing annexed (*Shakspeare*)

**ANNIBAL** See **HANNIBAL**

**ANNIHILABLE** *a*. (from *annihilate*) That may be put out of existence.

**To ANNIHILATE** *v a* (*ad* and *nilum*, Lat) 1 To reduce to nothing (*Bacon*) 2 To destroy (*Raleigh*) 3 To annul (*Hooker*)

**ANNIHILATION** *s* (from *annihilate*) The act of reducing to nothing, the state of being reduced to nothing (*Dryden*)

**ANNIVERSARY**, is properly the yearly return of any remarkable day; anciently also called a year-day, or mind-day, that is, a memorial-day. The word is formed from *annus* and *verto*, on account of its returning every year.

**ANNO DOMINI**, *q d* in the year of our Lord, the computation of time from the epocha of the incarnation of Jesus Christ. This is generally inserted in the dates of all public writings, with an addition of the year of the king's reign.

**ANNONA**. Custard-apple a genus of the class and order polyandria polygynia. Calyx three-leaved, petals six, berry many-seeded, rounded, with a scaly bark. Twenty-five species, all natives of the East or West Indies or America; a fleshy fruit is produced by most of them, and is palatable. The pulp of the a miloba of Caroline is highly sweet and luscious.

**ANNONA**, in Roman antiquity, provision of all sorts for a year.

**ANNONAY**, a town of France in the department of Ardeche. Lat 45 18 N Lon 4 45 E.

**ANNOTATIO, ANNOTATION** (from *annoto*, to mark) The attack or first mark of a febrile paroxysm.

**ANNOTATION** *s* (*annotatio*, Latin) Explication, note (*Boyle*)

**ANNOTATOR** *s* (Latin) A writer of notes, a scholiast, a commentator (*Felton*)

**ANNOTIO, ANOTTO, or ANNOTTA**, in commerce, a kind of red dye, brought from the West Indies. It is procured from the pulp of the seed-capsules of a tree called *bixa* in South America. See **BIXA**.

The *annotto* is prepared only by the Spaniards, the mode is as follows: the contents of the fruit or capsule are thrown into a wooden bowl, where as much hot water is poured on them as is necessary to suspend the red matter or pulp. When the seeds are left quite naked, they are taken out, and the wash is left to settle. The water is then poured off, and the sediment dried by degrees in the shade, after which it is made into balls or cakes for exportation. See **ARNOTTA**.

**To ANNO'UNCE** *v a* (*annonceer*, Fr) 1 To publish, to proclaim (*Milton*) 2 To declare by a judicial sentence (*Prior*)

**To ANNOY** *v a* (*annoyer*, Fr) To incommode, to vex, to tease, to molest (*Sidney*)

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**ANNOY**, *v.* (from the verb) Injury, molestation, trouble (*Dryden*).

**ANNOYANCE**, *s.* (from *annoy*) 1 That which annoys (*Shakspeare*) 2 The act of annoying (*South*)

**ANNOYER**, *s.* (from *To annoy*) The person that annoys

**ANNUAL**, *a.* (*annuel*, *Fr*) 1 That comes yearly (*Pope*) 2 That is reckoned by the year (*Shakspeare*) 3 That lasts only a year (*Ray*)

**ANNUAL EQUATION**, in astronomy See **EQUATION**

**ANNUAL PLANT OR ROOT**, perishing within the compass of a year opposed to biennial or perennial The stem of herbaceous plants, although the root be permanent, is annual, and thus is distinguished from that of trees and shrubs

**ANNUALLY**, *ad* (from *annual*) Yearly, every year (*Brown*)

**ANNUEL** in the Scottish law, denotes any yearly revenue, or due, paid at certain terms, either legal, as Martinmas and Whitsuntide, or conventional, as the parties agree

**ANNUEL OF NORWAY**, of which mention is made in the acts of parliament of king James the Third, was an annual payment of an hundred marks sterling, which the kings of Scotland were obliged to pay to the kings of Norway, in satisfaction for some pretensions which the latter had to the Scottish kingdom, by virtue of a conveyance made thereof by

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**Malcolm Canmor**, who usurped the crown after his brother's decease

**ANNUITANT**, *s.* He that possesses or receives an annuity

**ANNUITIES**, a term for any periodical income, arising from money lent, or from houses, lands, salaries, pensions, &c payable from time to time, either annually, or at other intervals of time

Annuities may be divided into such as are certain, and such as depend on some contingency, as the continuance of a life, &c

Annuities are also divided into annuities in possession, and annuities in reversion, the former meaning such as have commenced, and the latter such as will not commence till some particular event has happened, or till some given period of time has elapsed

Annuities may be farther considered as payable either yearly, or half-yearly, or quarterly, &c

The present value of an annuity, is that sum, which, being improved at interest, will be sufficient to pay the annuity

When an annuity is forborn for some years, or the payments not made for that time, the annuity is said to be in arrears, in which case each payment is to be considered as a sum put out to interest for the remainder of the term after the time it becomes due

The amounts of annuities, or their present values, are easily found by the two following tables, properly computed from the principles of annuities

TABLE I.

The Amount of an Annuity of 11 at Compound Interest

Yrs	at 5 per cent	3 per cent	4 per cent	4½ per cent	5 per cent	6 per cent
1	1 00000	1 000 00	1 00000	1 00000	1 00000	1 00000
2	2 03000	2 03500	2 04000	2 04500	2 05000	2 06000
3	3 09090	3 10623	3 12160	3 13703	3 15250	3 16360
4	4 18367	4 21494	4 24646	4 27819	4 31013	4 37462
5	5 30911	5 36247	5 41632	5 47071	5 52563	5 63709
6	6 46841	6 55015	6 73298	6 81689	6 80191	6 97532
7	7 66246	7 77941	7 89830	8 01915	8 14201	8 30384
8	8 89234	9 03169	9 21423	9 38001	9 54911	9 89747
9	10 15911	10 36850	10 56280	10 80211	11 02656	11 49132
10	11 46988	11 73139	12 00611	12 28221	12 57789	13 18079
11	12 80780	13 11199	13 48035	13 84118	14 20679	14 97164
12	14 19203	14 60196	15 02581	15 46403	15 91713	16 86994
13	15 61779	16 11303	16 62684	17 15991	17 71298	18 88214
14	17 08632	17 67699	18 29191	18 93211	19 59863	21 01507
15	18 59891	19 29568	20 02359	20 78405	21 57856	23 27597
16	20 15688	20 97103	21 82473	22 71934	23 65749	25 67253
17	21 76159	22 70502	23 69751	24 74171	25 84037	28 21288
18	23 41444	24 49969	25 64541	26 85508	28 13238	30 90565
19	25 11687	26 33718	27 67123	29 06556	30 53900	33 75499
20	26 87037	28 27968	29 77808	31 37142	33 06595	36 78559
21	28 67649	30 26947	31 96920	33 78314	35 71725	39 99273
22	30 53678	32 32890	34 24797	36 30338	38 50521	43 39229
23	32 45288	34 46041	36 61789	38 93703	41 43048	46 99583
24	34 42647	36 66633	39 08260	41 68920	44 50200	50 81558
25	36 45926	38 94986	41 64591	44 56521	47 72710	54 86451
26	38 55304	41 31310	44 31174	47 57064	51 11345	59 15638
27	40 70963	43 75906	47 08421	50 71132	54 66913	63 70577
28	42 93092	46 29063	49 96758	53 99333	58 40258	68 52811
29	45 21885	48 91080	52 96629	57 42363	62 32271	73 63980
30	47 57012	51 62268	56 08494	61 00707	66 43885	79 05819

# ANNUITY

*Continuation of Table I.*

Yrs	at 3 per cent	3½ per cent	4 per cent	4½ per cent	5 per cent	6 per cent
31	50 00268	54 42947	59 32834	64 75239	70 76079	84 80165
32	52 50276	57 33450	62 70147	68 66625	75 29883	90 88978
33	55 07784	60 34121	66 20953	72 75623	80 06377	97 34316
34	57 73018	63 45315	69 85791	77 03026	85 06696	104 18375
35	60 46208	66 67401	73 65222	81 49662	90 32031	111 43478
36	63 27594	70 00760	77 59831	86 16397	95 83632	119 12087
37	66 17422	73 45787	81 70225	91 04134	101 62814	127 26812
38	69 15945	77 02889	85 97034	96 13820	107 70955	135 90421
39	72 23423	80 72491	90 40915	101 46442	114 09502	145 05846
40	75 40126	84 55028	95 02552	107 03032	120 79977	154 76197
41	78 66330	88 50954	99 82654	112 84669	127 83976	163 04768
42	82 02320	92 60737	104 81960	118 92479	135 23175	175 95054
43	85 48389	96 84863	110 01238	125 27640	142 99534	187 50758
44	89 04841	101 23833	115 41288	131 91384	151 14301	199 77503
45	92 71986	105 78167	121 02939	138 84997	159 70016	212 74351
46	96 50146	110 48403	126 87057	146 09821	168 68516	226 50812
47	100 39650	115 35097	132 94589	153 67263	178 11912	241 09861
48	104 40840	120 38826	139 26321	161 58790	188 02559	256 56453
49	108 54065	125 60185	145 83373	169 85936	198 42666	272 95840
50	112 79687	130 99791	152 66708	178 50303	209 34800	290 33590
51	117 18077	136 58284	159 77377	187 53566	220 81540	308 75606
52	121 69620	142 36324	167 16472	196 97477	232 85617	329 28142
53	126 34708	148 34595	174 81131	206 83863	245 49897	348 97931
54	131 13750	154 53806	182 84536	217 14637	258 77392	370 91701

## TABLE II

*The present Value of an Annuity of 1*

Yrs	at 3 per cent	3½ per cent	4 per cent	4½ per cent	5 per cent	6 per cent
1	0 97087	0 96618	0 96154	0 95691	0 95238	0 94340
2	1 91347	1 89969	1 88610	1 87267	1 85941	1 83339
3	2 82361	2 80164	2 77509	2 74896	2 72325	2 67301
4	3 71710	3 67308	3 62990	3 58753	3 54595	3 46511
5	4 57971	4 51505	4 45162	4 38998	4 32948	4 21236
6	5 41719	5 32855	5 24214	5 15787	5 07569	4 91732
7	6 23028	6 11454	6 00205	5 89270	5 78637	5 59238
8	7 01969	6 87396	6 73274	6 59589	6 46321	6 20979
9	7 78611	7 60769	7 43533	7 26879	7 10782	6 80169
10	8 53020	8 31661	8 11090	7 91272	7 72173	7 36009
11	9 25262	9 00155	8 76048	8 52892	8 30541	7 88687
12	9 95400	9 66333	9 38507	9 11858	8 86325	8 38354
13	10 63496	10 30274	9 98565	9 68285	9 39357	8 85268
14	11 29607	10 92052	10 56312	10 22283	9 89864	9 29498
15	11 93794	11 51741	11 1839	10 73955	10 37966	9 71225
16	12 56110	12 09412	11 6230	11 23402	10 83777	10 10590
17	13 16612	12 65132	12 16567	11 70719	11 27407	10 47726
18	13 75351	13 18968	12 67030	12 15999	11 68959	10 82760
19	14 32390	13 70984	13 13394	12 59329	12 08532	11 15812
20	14 87747	14 21240	13 59033	13 00794	12 46221	11 46992
21	15 41502	14 69797	14 02916	13 40472	12 82115	11 76408
22	15 93692	15 16712	14 45112	13 78442	13 16300	12 04158
23	16 44361	15 62041	14 85684	14 14777	13 48857	12 30338
24	16 93554	16 05837	15 24696	14 49548	13 79864	12 55036
25	17 41315	16 48151	15 62208	14 82821	14 09394	12 78536
26	17 87684	16 89035	15 98277	15 14661	14 37519	13 00317
27	18 32703	17 28556	16 32959	15 45130	14 64303	13 21053
28	18 76411	17 66702	16 66306	15 74287	14 89813	13 40616
29	19 18845	18 03577	16 98371	16 02189	15 14107	13 59072
30	19 60044	18 39205	17 29203	16 28889	15 37245	13 76483
31	20 00043	18 73628	17 58849	16 54439	15 59231	13 92909
32	20 38877	19 06987	17 87355	16 78989	15 80268	14 08404
33	20 76579	19 39021	18 14765	17 02286	16 00255	14 23023
34	21 13184	19 70068	18 41120	17 24676	16 19290	14 36814
35	21 48722	20 00066	18 66461	17 46101	16 37419	14 49825

## Continuation of Table II

Yrs.	3 per cent	3½ per cent	4 per cent	4½ per cent	5 per cent	6 per cent
21 83225	20 89049	18 90828	17 86604	16 54685	14 62099	
22 16724	20 37053	19 14238	17 86234	16 71129	14 73678	
22 49246	20 84109	19 36786	18 04999	16 86789	14 84802	
22 80822	21 10250	19 58448	18 22966	17 01704	14 94907	
23 11477	21 35507	19 79277	18 40158	17 15909	15 04630	
23 41240	21 59910	19 99305	18 56611	17 29437	15 13802	
23 70136	21 82488	20 18563	18 72355	17 42321	15 22454	
23 98190	22 06269	20 37079	18 87421	17 54391	15 30617	
24 25427	22 28279	20 54884	19 01838	17 66277	15 38318	
24 51871	22 49545	20 72004	19 15635	17 77407	15 45583	
24 77545	22 70092	20 88465	19 28837	17 88007	15 52437	
25 02471	22 89944	21 04294	19 41471	17 98102	15 58903	
25 26671	23 09124	21 19513	19 53561	18 07716	15 65003	
25 50166	23 27656	21 34147	19 65130	18 16872	15 70757	
25 72976	23 45562	21 48218	19 76201	18 25593	15 76186	
25 95123	23 62862	21 61749	19 86795	18 33898	15 81308	
26 16624	23 79576	21 74758	19 96939	18 41807	15 86139	
26 37499	23 95726	21 87267	20 06654	18 49340	15 90697	
26 57766	24 11330	21 99296	20 15918	18 56515	15 94998	

## The Use of Table I

*To find the amount of an Annuity forborn any number of years.* Take out the amount from the first table, for the proposed years and rate of interest, then multiply it by the annuity in question, and the product will be its amount for the same number of years and rate of interest.

And the converse to find the rate or time

*Exam 1.* To find how much an annuity of 50*l* will amount to in 20 years at 3½ per cent compound interest.—On the line of 20 years, and in the column of 3½ per cent stands 28 27968, which is the amount of an annuity of 1*l* for the 20 years, and therefore 28 27968 multiplied by 50, gives 1413 984*l* or 1413*l* 19*s*. 8*d* for the answer.

*Exam 2.* In what time will an annuity of 20*l* amount to 1000*l* at 4 per cent compound interest?—Here the amount of 1000*l* divided by 20*l* the annuity, gives 50, the amount of 1*l* annuity for the same time and rate. Then, the nearest tabular number in the column of 4 per cent, is 49 96758, which standing on the line of 28, shews that 28 years is the answer.

*Exam 3.* If it be required to find at what rate of interest an annuity of 20*l* will amount to 1000*l* forborn for 28 years. Here 1000 divided by 20 gives 50 as before. Then looking along the line of 28 years for the nearest to this number 50, I find 49 96758 in the column of 4 per cent which is therefore the rate of interest required.

## The Use of Table II

*Exam 1.* To find the present value of an annuity of 50*l* which is to continue 20 years, at 3½ per cent.—By the table, the present value of 1*l* for the same rate and time, is 14 21240, therefore 14 21240  $\times$  50 = 710 62*l* or 710*l* 12*s*. 4*d* is the present value sought.

*Exam 2.* To find the present value of an annuity of 20*l* to commence 10 years hence, and then to continue 40 years, or to terminate 50 years hence, at 4 per cent interest.—In such cases as this, it is plain we have to find the difference between the present values of two equal annuities, for the two given times,

which therefore will be effected by subtracting the tabular value of the one term from that of the other, and multiplying by the annuity. Thus,

Tabular value for 50 years	21 18218
Ditto for 10 years	8 11090
the difference	13 37128
multiplied by	20

gives 267 4*l* 6*d*

or 267*l* 8*s* 6*d* the answer

Those who are desirous of obtaining complete information on the subject of annuities, are referred to Malcolm's and Keith's Arithmetics, Simpson's Algebra, and his book on Annuities and Reversions, Dodson's Mathematical Repository, and Price's excellent Treatise on Annuities and Reversionary Payments.

For what relates to the doctrine of annuities on lives, see ASSURANCE, COMPLEMENT EXPECTATION, LIFE ANNUITIES, REVERSIONS, &c.

*To ANNULL* *v a* (from *nullus*, Lat) 1 To make void, to nullify 2 To reduce to nothing to obliterate

*ANNULAR* *a* (from *annulus*, Lat) Having the form of a ring

*ANNULAR BONE* *Circulus ossis* A ring like bone placed before the cavity of the tympanum in the foetus

*ANNULAR CARTILAGES* See *CRICOID CARTILAGES*

*ANNULARIS DIGITUS* The ring finger The one between the little and middle finger

*ANNULARIS PROCESSUS* See *PONS VARIOSI*

*ANNULARY* *a* Having the form of rings

*ANNULET*, in architecture, a small square member in the Doric capital, under the quarter round. It is also a narrow flat moulding, which is common to divers parts of the columns, as the bases, capitula, &c. It is the same member which Vitruvius calls a fillet.

**ANNULET**, in heraldry, a mark of distinction which the fifth brother of a family ought to bear in his coat of arms

**ANNULLING**, a term sometimes used for cancelling or making void a deed, sentence, or the like

**ANNULUS**, a ring, in geometry, the area of which is equal to the difference of the areas of the outer and inner circles or it may be found by multiplying the sum of their diameters by the difference, and the product by 7854

**To ANNUMERATE** *v a* (*annumero*, Lat) To add to a former number

**ANNUMERATION** *s* (*annumeratio*, It) Addition to a former number

**To ANNUNCIATE** *v a* (*annuncio*, Latin) To bring tidings

**ANNUNCIATE**, **ANNUNTIADA**, or **ANNUNTIATA**, a denomination common to several orders, both religious and military, instituted with a view to the Annunciation The first religious order of this kind was instituted in 1232, at Florence

**ANNUNCIATA**, or knights of the Annuntiadi, was a military order, instituted in 1362, by Amadeus VI duke of Savoy, in memory of Amadeus I who defended the isle of Rhodes against the Turks

**ANNUNCIATION-DAY** *s* (from *annunciate*) The day celebrated by the church, in memory of the angels salutation of the Blessed Virgin, solemnized with us on the twenty-fifth of March (*Taylor*)

The Jews give the title Annunciation to part of the ceremony of their passover, viz that wherein they explain the origin and occasion of that solemnity—This explanation they call חגגה, Haggada, q d the Annunciation

**ANOBIUM**, a tribe of Fabricius See **PTINUS**

**ANOCATHARTICS** (*ανακαθαρτικα*, from *ana*, upwards, and *καθαρω*, to purge) Emetics medicines which purge upwards

**ANODA**, in botany. See **SIDA**

**ANODMUS**, **ANO'DMUS** (from *a priv* and *ωω*, to smell) 1 Destitute of the sense of smell 2 Destitute of odour or aroma

**ANODYNES** (*anodyna*, *ανωδυνα*, from *a priv* and *δυνω*, pain) Narcotics Hypnotics Opiates Paracotics Antalgics Those medicines are so termed which ease pain and procure sleep

**To ANOINT** *v a* (*oindre*, *enointre*, part oint, *enoint* Fr) 1 To rub over with unctuous matter (*Shaks*) 2 To smear, to be rubbed upon (*Dryden*) 3 To consecrate by unction (*Shakspeare*)

**ANOINTER** *s* (from *anoint*) The person that anoints

**ANOLYMPIADS**, those Olympic games which were celebrated under the direction of the Arcadians and Pisæans

**ANOMALISM** *s* (from *anomaly*) Irregularity

**ANOMALISTICAL YEAR**, in astronomy, called also periodical year, is the space of

time in which the earth, or a planet, passes through its orbit The anomalistical, or common year, is somewhat longer than the tropical year, by reason of the precession of the equinox And the apses of all the planets have a like progressive motion, by which it happens that a longer time is necessary to arrive at the aphelion, which has advanced a little, than to arrive at the same fixed star To find the anomalistic revolution, say, As the whole secular motion of a planet minus the motion of its aphelion, is to 100 years or 3155760000 seconds, so is 360°, to the duration of the anomalistic revolution.

**ANOMALOUS** *a* (from *a priv* and *ανωμος*) Irregular, out of rule, deviating from the general method or analogy of things (*Locke*).

**ANOMALOUS** This term is often applied to those diseases whose symptoms do not appear with that regularity generally observed in diseases A disease is also said to be anomalous when the symptoms are so varied as not to bring it under the description of any known affection

**ANOMALOUSLY** *ad* (from *anomalous*) Irregularly (*Brown*)

**ANOMALY** *s* (*anomalie*, Fr) Irregularity, deviation from the common rule (*South*)

**ANOMALY**, in astronomy, is an irregularity in the motion of a planet, by which it deviates from the aphelion or apogee, or it is the angular distance of the planet from the aphelion or apogee, that is, the angle formed by the line of the apses, and another line drawn through the planet

Kepler distinguishes three kinds of anomaly, true, mean, and excentric

The true anomaly, or equated anomaly, as it is sometimes called, is the angle at the sun which is formed by the radius vector, or line drawn from the sun to the planet, and the line drawn from the sun to the aphelion of the planet the mean anomaly is the angular distance of a planet from its aphelion (taken at the same time with the true anomaly), supposing it to move uniformly with its mean angular velocity The difference between the true and mean anomaly is called the equation of the centre, or the prosthapheresis

If a circle be supposed drawn on the line of the apses as a diameter, and through the place of the planet a perpendicular to the line of the apses be drawn till it meet the circumference of the circle, then the angle formed by two lines, one drawn from the centre of the planet's orbit to the aphelion, and the other to the point where the perpendicular through the planet's place intersects the circumference of the circle, is called the excentric anomaly, or the anomaly of the centre

Thus, in fig 2 pl 5 where AB is the line of the apses, and S the place of the sun, the planet being at P, the angle ASP is the true anomaly, ASD the mean anomaly (the circular trilineal ASD being to the whole circle, as the elliptic trilineal ASP to the whole ellipse), and ACD the excentric anomaly



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The mean anomaly is always proportional to SG (a right line drawn perpendicular to DC produced)  $\div$  the circular arc AD, as is shown in Keill's Lectures and other places.

The true anomaly being given, it is easy to find the mean, in the following manner: the excentricity  $c$  being known, and RS or AC being expressed by unity, we have  $CR = \sqrt{R^2 - c^2}$ , CH being perpendicular to AC; whence the ratio of AC to RC is known, and this is the ratio of DE to PF by the nature of the ellipse and circumscribing circle: hence, the angle ASP being given, we have  $PE : DE :: \text{tang ASP} : \text{tang ASD}$ . And in the triangle DSC, we know DC, SC, and the angle CSD, whence we find SCD, the supplement of which is SCG. Then in the triangle SCG, we know SCG and SC, from which we get SG, which reduced to degrees, by reckoning  $57^\circ 17' 44''$  as equivalent to radius, or 1, and added to ACD, gives the mean anomaly.

But the mean anomaly being given, it is not so easy to find the true, at least, by a direct process. Kepler, who first proposed this problem, solved it by the rule of false position, as may be seen at p 695 of his Epitome Astron Copernici. The solution has been attempted by some of the ablest mathematicians, we have not room to lay down the result of many of their investigations, and can only, therefore, present our readers with the excellent approximating rules of M de la Caille, which ascertain not only the true anomaly, but the planets relative distance from the sun.

I As the aphelion distance is to the perihelion distance, so is the tangent of half the mean anomaly to the tangent of an arc, which added to that half, the sum is called the approximated excentric anomaly. If the difference between the approximated and mean anomalies does not exceed 3 deg its difference from the true excentric anomaly will not amount to a second. When this happens, which is always the case in the orbit of the earth, the next four articles become useless, nevertheless, as they are of utility in determining the true anomaly of the other planets, they are added. II As half the greater axis is to the excentricity, so are  $57^\circ 17' 44''$  (or  $206264''$  whose logarithm is 5.3144250) to a number of seconds, which call A. III As radius to the seconds A, so is the sine of the approximated excentric anomaly (I) to another number of seconds, which, taken from the mean anomaly, gives another approximated excentric anomaly. IV As radius to the seconds A, so is the sine of the new approximated excentric anomaly to a number of seconds, which, subtracted from the mean anomaly, gives also another approximated excentric anomaly. V This analogy must be repeated, always putting the sine of the last found approximated anomaly for the third term, till two be found successively, which are equal, then either will be the true excentric anomaly. VI As the square root of the aphelion distance is to the square root of the

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perihelion distance, so is the tangent of half the true excentric anomaly to the tangent of half the true anomaly sought. If these anomalies should exceed  $180^\circ$ , their supplements, or half their supplements, must be used instead of these anomalies, or their halves. VII As radius to the co-sine of the true anomaly, so is the excentricity to a fourth quantity B, then, as half the greater axis, plus or minus the quantity B, to the perihelion distance, so is the aphelion distance to the distance sought. B must be added in the 3d, 4th, 5th, 6th, 7th, and 8th signs of the true anomaly, but subtracted in the other signs.

Much useful information on this subject may be obtained from Keill's Astron Cassini's Astron O Gregory's Astron ch xi Hutton's Mensura page 298, and Vince's Astron vol 1 p 105, &c See also the article EQUATION OF THE CENTRE, in this work.

**ANOMIA** In zoology, a genus of the class and order vermes testacea thus characterized. Animal an emerginate ciliate strap-shaped body, with bristles or fringe affixed to the upper valve, arms two, linear, longer than the body, connivent, projecting, alternate on the valve, and ciliate each side, the fringe affixed to each valve. shell bivalve, inequivalve, one of the valves flattish, the other gibbous at the base, with a produced beak, generally curved over the hinge, one of the valves often perforated near the base. hinge with a linear prominent cicatrix and a lateral tooth placed within, but in the flat valve on the very margin. two bony rays for the base of the animal. Fifty-one species, spread through the different seas of the globe on its shores. many of which, however, have only been found in a fossile state. In this state two are occasionally met with in our own country, and the only ones that have yet been discovered the a cuspidata found in Derbyshire, and a spinosa found in other places as well.

**ANOM(EANS)**, in ecclesiastical history, the name by which the pure Arians were called in the fourth century, in contradistinction to the Semi-Arians. The word is formed from the Greek, *ανωμαιος*, different, dissimilar. For the pure Arians asserted that the Son was of a nature different from, and in nothing like, that of the Father, whereas the Semi-Arians acknowledged a likeness of nature in the Son, at the same time that they denied, with the pure Arians, the consubstantiality of the Word.

**ANOMY**  $\alpha$  ( $\alpha$  priv and *νομος*, ) Breach of law (*Bramhall*).

**ANO'N** *ad* 1 Quickly, soon, in a short time (*Waller*). 2 Now and then, at other times (*Milton*).

**ANO'NYMOUS** *a* ( $\alpha$  priv and *ονυμα* ) Wanting a name (*Ray*).

**ANO'NYMOUSLY** *ad* Without a name.

**ANO'RCHIDES** (*anorchis*, *ανωρχις*; from  $\alpha$  priv and *ορχις*, the testicle ) Children are so termed which come into the world without testicles. This is a very common occurrence. The testicles in the human subject begin to

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descent about the seventh month of gestation, and about the eighth usually pass into the scrotum. If the descent do not take place till after birth, it is generally a long time, and perhaps many years before it is accomplished. See TESTES.

**ANOREXIA** (*anorexia*, from *a* priv and *orexi*, *appetite*) A want of appetite, without loathing of food. Cullen ranks this genus of disease in the class locales, and order dysorexiæ, he believes it to be generally symptomatic, but enumerates two species, viz the *anorexia humorilis* and the *anorexia atonica*.

**ANOSMIA** (*anosmia*, *ανωσμία*, from *a* priv and *osm*, *to smell*) A loss of the sense of smelling. This genus of disease is arranged by Cullen in the class locales, and order dyssæsthesiæ. When it arises from a disease of the Schneiderian membrane, it is termed *anosmia organica*, and when from no manifest cause, *anosmia atonica*.

**ANOSI, CARCAURSI, or ANDROBETZAHIA**, in geography, a province of Madagascar, situate in S lat 23 18, and extending from the province of Manatengha to the river Mndkrei, in lat 26.

**ANOTHER** *a* (from *an* and *other*) 1 Not the same (*Locke*) 2 One more (*Shakspeare*) 3 Any other (*Samuel*) 4 Not one's self (*South*) 5 Widely different (*South*)

**ANOTHERGAINS** *a* Of another kind obsolete (*Sidney*)

**ANOTHERGUSS** *a* Of another kind a low word (*Arbutnot*)

**ANOTIA, or ARNOTIA**, in dyeing, an elegant red colour, formed from the pellicles or pulp of the seeds of the bixa, a tree common in South America. It is also called *Terra Orleani*, and *roucou*. In making it, the red seeds are steeped in water till the liquor begins to ferment, then strongly stirred and stamped with wooden beaters, to promote the separation of the red skins: this process is repeated several times, till the seeds are left white. The liquor passed through close cane sieves is pretty thick, of a deep red colour, and a very ill smell. In boiling, it throws up its colouring matter to the surface in form of scum, which is afterwards boiled down by itself to a due consistence and made up while soft into balls. A rectified spirit of wine it very readily communicates a high orange or yellowish red, and hence is used as an ingredient in varnishes, for giving an orange-cast to the simple yellows. Alkaline salts render it perfectly soluble in boiling water, without altering its colour. Wool or silk boiled in the solution acquires a deep, but not a very durable orange-  
ye

**ANOTTA**, in botany. See BIXA.

**ANSÆ**, in astronomy, implies the parts of Saturn's ring projecting beyond the disk of the planet. The word properly signifies handles, these parts of the ring appearing like handles to the body of the planet.

**ANSARIANS**, a people of Syria, so called in the country, but styled in Delisle's maps

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**Ansarians**, and in those of Danville, *Nassaræ*. The territory occupied by these Ansaria is that chain of mountains which extends from Antakia to the rivulet called *Nahr-el-Kahr*, or the Great River.

**ANSATED** *a* (*ansatus*, Lat.) Having handles.

**ANSATUS**, in conchology, a species of *muræx*.

**ANSER**, in astronomy, a star of the fourth or fifth magnitude, in the milky way, lying between *Lyra* and *Aquila*.

**ANSERFS** In zoology, the third order of the Linnean class aves thus ordinarily characterised. Bill smooth, covered with a soft skin, and broader at the point, feet formed for swimming, toes palmate, connected by a membrane, shanks short, compressed, body fat, downy, flesh mostly tough, food fishes, frogs, aquatic plants, worms, &c. nest mostly on the ground, the mother takes but little care in providing for the young frequently polygamous. For the genera, see ZOOLOGY.

**ANSERINA** (*anserina*, from *anser*, a goose, so called because geese eat it) Wild turney or goose-grass. *Argentina*. This herb, *potentilla anserina*, foliis innatis serratis, caule repente, pedunculis unifloris of Linnæus, was formerly used as an astingent in laxity of the intestines and phthisical complaints, but is now fallen into disuse.

**ANSE** See ANSÆ.

**ANSIKO**, a kingdom of Africa, bounded on the W by the river Umbré, on the N by some deserts of Nubia, and on the S by Songo and Sunda, provinces of Congo.

**ANSON** (George, lord), was the son of William Anson, esq. of Hockborough in Staffordshire, at whose seat he was born in 1697. He went to sea very early, and in 1724 was made post-captain. Being sent to South Carolina, he purchased land, and built a town there, which is called after his name. In 1739 he was chosen commander of an expedition against the Spanish settlements in South America, and sailed from Portsmouth, September 18, 1740, with five men of war, a sloop, and two victuallers. He doubled Cape Horn in March 1741, after losing two of his ships. In June following he arrived off Juan Fernandez, with no more than two ships, two tenders, and only 335 men. This place he left in September, took some prizes, burnt Paita, and continued on the American coast, in expectation of falling in with the annual *Acapulco* ship, till May 1742, when having only his own ship, the *Centurion* of 64 guns, left, he crossed the southern ocean for China, where he staid several months, and then returned in quest of the galleon, which he fell in with, and captured after a smart action. Having sold his prize in China, he sailed for England, and arrived at Spithead, June 15, 1744, having sailed in a fog through the midst of the French fleet, then cruising in the Chops of the Channel. Not long after his return he was made rear-admiral of the blue, and one of the lords of the admiralty. He was also chosen member

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of parliament for the borough of Heydon In 1747, he commanded the Channel fleet, and fell in with six French men of war, and four East-Indiamen, all of which he captured for these services he was created by George II lord Anson, baron of Soberton, in Hants, and on the death of sir John Norris, he was appointed vice-admiral of England In 1751, he was appointed first lord of the admiralty, which post he held, with a slight interval, till his death In 1758, he commanded the Channel fleet, having under him the gallant sir Edward Hawke After this he was appointed admiral and commander-in-chief of his majesty's fleets The last service he was engaged in, was in conveying to England her present majesty He died suddenly at his seat at Moorpark, in Hertfordshire, June 6, 1762 He married a daughter of the late earl of Hardwicke, who died before him without issue Lord Anson was a cool and steady man, but too fond of play, of which he knew but little, so that he was the constant dupe of sharpers, this made some person say smartly, that "though he had been round the world, he was never in it" His Voyage round the World was drawn up under his own eye, by Mr Benjamin Robins, though published in the name of the chaplain, Mr Walter

**ANSPACH**, a town and castle of Franconia, and capital of the margravate of Anspach It is seated on a river of the same name Lat 49 20 N Lon 10 47 E

**ANSTRUTHER**, a borough on the SE coast of Fifehire Lat 56 15 N Lon 2 34 W

To **ANSWER** *v n* (and *ὑπαπαντα*, Saxon)  
1. To speak in return to a question (*Dryden*)  
2 To speak in opposition (*Boyle*) 3 To be accountable for (*Brown*) 4 To vindicate, to give a justificatory account of (*Swift*) 5 To give an account (*Temple*) 6 To correspond to, to suit with (*Prov*) 7 To be equivalent to (*Lectionarius*) 8 To satisfy any claim or petition (*Raleigh*) 9 To act reciprocally (*Dryden*) 10 To stand as opposite or correlative to something else (*Taylor*) 11 To bear proportion to (*Swift*) 12 To perform what is endeavoured or intended by the agent (*Atterbury*) 13 To comply with (*Shakspeare*) 14 To succeed, to produce the wished event (*Bacon*) 15 To appear to any call, or authoritative summons (*Shakspeare*) 16 To be over against any thing (*Shakspeare*)

**ANSWER** *s* (from the verb) 1 That which is said in return to a question, or position (*Atterbury*) 2 Confutation of a charge (*Aylmer*)

**ANSWER-JOBBER** *s* He that makes a trade of writing answers (*Swift*)

**ANSWERABLE** *a* (from *answer*) 1 That to which a reply may be made 2 Obligated to give an account (*Swift*) 3 Correspondent (*Sidney*) 4 Proportionate (*Milton*) 5 Suitable; suited (*Milton*) 6 Equal, equivalent (*Raleigh*) 7 Relative, correlative (*Boyle*)

**ANSWERABLENESS** *s* (from *answerable*) The quality of being answerable

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**ANSWERABLY** *ad* (from *answerable*) In due proportion, with proper correspondence, suitably (*Brewster*)

**ANSWERER** *s* (from *answer*) 1 He that answers 2 He that manages the controversy against one that has written first (*Swift*)

**ANT** A contraction for *and it*, or *and if it*

**ANT**, in entomology See **FORMICA**

**ANT-BEAR** and **ANT-EATER** See **MYRMECOPHAGE**

**ANT-HILLS**, in husbandry, little hillocks of earth which the ants throw up for their habitation for the breeding their young They are a very great mischief to dry pastures, not only by wasting so much land as they cover, but by hindering the cythe in mowing the grass, and yielding a poor hungry food, pernicious to cattle

**ANTA**, in the ancient architecture, a square pilaster, placed at the corners of buildings Anta is used by M Le Clerc for a kind of shaft of a pillar, without base or capital, and even without any moulding

**ANTA**, in zoology See **TAPIR**

**ANTACIDS** (*antacida*, sc *medicamenta*, from *anti*, against, and *acidus*, acid) Those medicines that have the power of destroying acidities in the stomach and intestines The remedies which possess this power are comprehended in two orders 1 Ecceprotic antacids is magnesia alba, tartarum solubile, sapo, and all alkaline preparations, which are also calculated to remove costiveness 2 Restricting antacids, as crata, oculi cancerorum testæ ostreorum, and other forms of the carbonat of lime, which are to be selected when there is a looseness of the bowels

**ANTACRIDA** **ANTACRIDS** (from *anti*, against, and *acris*, sharp) Medicines which correct or destroy acrimony

**ANTAL**, in ancient architecture, square pilasters placed at the corners of gateways, walls, &c of temples

**ANTÆUS**, in fabulous history, a giant of Libya, son of Neptune and Terra Designing to build a temple to his father of men's skulls, he slew all he met, but Hercules fighting him, and perceiving the assistance he received from his mother, lifted him up from the ground, and squeezed him to death

**ANTAGONIST** *s* (*αντι* and *αγωνιστω*) 1 One who contends with another, an opponent (*Milton*) 2 Contrary (*Addison*)

**ANTAGONIST MUSCLES** (*musculi antagonisti*, from *αντι*, against, and *αγωνιστω*, to strive) Muscles are so called, which act in opposition to others

To **ANTAGONIZE** *v a* (*αντι* and *αγωνιστω*) To contend against another

**ANTAGORAS** The most remarkable of this name was a Rhodian poet, much admired by Antigonus One day as he was cooking some fish, the king asked him whether Homer ever dressed any meals when he was recording the actions of Agamemnon? And do you think, replied the poet, that he ὡλοει τ' ἐπεισεραφαιεν

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και ταυτα μιμηται, ever enquired whether any individual dressed fish in his army? *Plut*

**ANTALGICA** **ANTALGICS** (*antalgica*, sc *medicamenta*, *αλγολυτα*, from *αντι*, against, and *αλγος*, pain) Remedies which ease pain

*Anodynes*

**ANTALKALINES** (*antalkalina*, sc *medicamenta*, from *anti*, against, and *alkali*, an alkali) Medicines which possess the power of neutralizing alkalis

**ANTIACCLASIS** *s* (from *αντακλασις*)  
1 A figure in rhetoric, when the same word is repeated in a different manner, if not in a contrary signification 2 It is also a return-  
ing to the matter at the end of a long paren-  
thesis (*Smith*)

**ANTIAPHRODITICK** *a* (from *αντι* and *αφροδιτη*) Efficacious against the venereal dis-  
ease

**ANTAPOPLECTICK** *a* (from *αντι* and *αποπληξις*) Good against an apoplexy

**ANTARADUS**, in ancient geography, a town of Syria, commonly called Tortosa

**ANTARCTICK** *a* (*αντι* and *αρκτις*) Some-  
thing opposite to the arctic or northern pole  
Thus, an arctic pole is the south pole, and  
antarctic circle is a less circle of the sphere,  
at the distance of 23° 28' from the south  
pole

**AN FARES**, in astronomy, a star of the first  
magnitude, marked α in Scorpio, and often  
called C or Scorpio

**ANGARIHRITICS** (from *αντι*, against, and *αρθριτις*, diseases of the joints, as rheuma-  
tism or gout) Remedies against these and  
similar maladies

**ANTASIHMATIC** (from *αντι*, against, and *ασθμα*, an asthma) Remedies against an  
asthma

**ANIATROPHICS** (from *αντι*, against, and *ατροφια*, a consumption, or decline) Me-  
dicines which oppose, or relieve consumptions

**ANTAVARI**, in geography, a province of  
Madagascar, is situated to the north of Mata-  
tance, in 21° 30' of S lat and bounded by the  
province and cape of Manousi

**ANTE**, in heraldry, denotes that the pieces  
are let into one another in such form as is  
there expressed, as, for instance, by dove-tails,  
rounds, swallows tails, or the like

**A'NTE** A Latin particle signifying *before*,  
which is frequently used in composition, as,  
antediluvian, before the flood

**A'NTEACT** *s* (from *ante* and *act*) A  
former act

**ANTEAMBULATION** *s* (from *ante*  
and *ambulo*, Lat) A walking before

**ANTEAMBULONES**, in Roman anti-  
quity, servants who cleared the way before  
persons of distinction

**ANTECANIS**, a name sometimes given to  
the constellation Canis minor

To **ANTECEDE** *v n* (from *ante* and  
*cedo*, to go) To precede, to go before (*Hale*)

**ANTECEDENCE** *s* (from *antecede*)  
The act or state of going before (*Hale*)

**ANTECEDENT** *a* (*antecedens*, Latin)  
Going before, preceding (*South*)

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**ANTECEDENT** *s* (*antecedens*, Latin) 1.  
That which goes before (*South*) 2. [In  
grammar] The noun to which the relative is  
subjoined (*Ascham*) 3 [In logic] The  
first proposition of an enthymeme (*Watts*)

**ANTECEDENT OF A RATIO**, in mathe-  
matics, denotes the first term, or that which is  
compared with the other.

**ANTECEDENTAL METHOD**, a branch  
of general geometrical proportion, derived from  
an examination of the antecedents of ratios,  
having given consequents, and a given stand-  
ard of comparison, in the various degrees of  
augmentation and diminution; which they  
undergo by composition and decomposition  
This was invented by Mr James Glenie, and  
published by him in 1793, which he says he  
always used instead of the fluxional and differ-  
ential methods, and which is totally uncon-  
nected with the ideas of motion and time  
We do not learn, however, that any of our  
most active mathematicians have availed  
themselves of this calculus and if we esti-  
mate it by its practical utility, we shall proba-  
bly not find it productive of such advantages  
as its very learned author expected from it.  
This method, and that called the Residual  
Analysis, are monuments of the genius and  
profound knowledge of their respective in-  
ventors but we do not conceive that any real  
benefit would accrue to science, by substituting  
either of them in place of the method of  
fluxions

**ANTECEDENTIA**, a term applied by  
astronomers to denote that apparent motion of  
a planet, or other heavenly body, which is  
westward, or contrary to the order of the signs  
Aries Taurus, &c

**ANTECEDENTLY** *ad* (from *anteced-  
ent*) Previously (*South*)

**ANTCESSOR** *s* (Latin) One who  
goes before, or leads another, the principal

**ANTECHAMBER** *s* (from *ante* and  
*chamber*) The chamber that leads to the  
chief apartment (*Addison*)

**ANTECURSOR** *s* (Latin) One who  
runs before, a forerunner

To **A'NTEDATE** *v a* (from *ante* and *do*,  
*datum*, Latin) 1 To date earlier than the  
real time (*Donne*) 2 To take something  
before the proper time (*Pope*)

**ANTEDILUVIAN**, *a* (from *ante* and  
*diluvium*, a deluge) 1 Existing before the  
deluge (*Woodward*) 2 Relating to things  
existing before the deluge (*Brown*)

**ANTEDILUVIANS**, a general name for  
all mankind who lived before the flood, and  
in which are included the whole of the human  
race from Adam to Noah and his family

**ANTEGO**, or **ANTICUA**, one of the An-  
tilles or Caribbee isles, situated 20 leagues  
east of St Kitt's, in lat 17 4 N lon 62 9  
W It is about 50 miles in circuit

**ANTEJURAMENTUM**, an oath which  
anciently both accuser and accused were to  
take before any trial or purgation

**ANTELOPE** Antelope, A genus of the  
class and order mammalia pecora Horns

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**Antelope**, persistent, round, twisted spirally, or annulate; fore-teeth lower eight, tuskless. Twenty-eight species; inhabitants of all the continents but America, in which none have hitherto been discovered. They are chiefly found in hilly countries, climb up rocks, browse and feed on tender shoots, are very gregarious, active, timid, and swift, have gall-bladders and lachrymal pits under the eyes, a fold of skin divided into cells in the groins, brushes of hair on the knees, and beautiful black eyes, the flesh is in general good, but some have a rank or musky smell. See Nat. Hist. pl. XX. XXI. Those most worthy of notice are,

1. **A. rupicapra** Chamois. Horns erect, round, smooth, hips hooked back. Inhabits the Alps in troops, feeds on shrubs, herbs, and roots. Size that of a goat, flesh good.

2. **A. saiga** Scythian antelope. Horns distant, lyre-shaped, almost diaphanous, nose cartilaginous, arched. Inhabits Russia and Poland as far as the Altain Alps, in open deserts abounding in salt springs, timid, swift, gregarious in autumn, and migrates into southern deserts, bleats like a sheep, quick of smell, when feeding or sleeping is always guarded by a sentinel, walks backward while grazing; runs with the head very erect. Female hornless, brings usually one young, of a balsamic odour, flesh hardly edible.

3. **A. gnu**, or **Gnou**. Horns bent forwards at the base, backwards in the middle, neck maned, tail dirty white. Inhabits the plains of Africa behind the Cape of Good Hope, feeds in large troops, fierce, fights with its horns, resembling in its head an ox, body and tail, a horse, thighs, a stag, fur and lachrymal duct, the antelope, flesh good, three feet and a half high, six and a half long.

4. **A. gazella** Gazelle. Horns tapering, a little bent inwards, wrinkled. Inhabits India, Persia, Egypt, Ethiopia, in herds, runs swiftly up hills, easily tamed. In a variety named abomasus is found a greenish blue bearded, (esteemed the real), and when recent very aromatic, body red above, white beneath.

5. **A. orcas** Indian antelope. Horns tapering, straight, spirally carinate, body grey. Inhabits India, Congo, and the Cape. Gregarious, grows very fat, flesh good, horns are made into tobacco pipes by the natives. From five to eight feet high, horns two feet, dark brown.

6. **A. sylvatica** Wood antelope. Horns a little spirally twisted, carinate, sharp, smooth at the tips, body above brown, behind spotted with white, beneath chiefly white. Inhabits woods near the Cape of Good Hope. Lives in pairs; three feet high, body marked in various places with white spots, reddish brown, horns black, from ten to thirteen inches long, female hornless, neck and back a little shaped, flesh good.

7. **A. cervicapra** Common antelope. Horns spiral, round, annulate, body brown, hindquarters with reddish and dusky. Inhabits Africa and India. Less than the deer.

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8. **A. leucophaea** Blue antelope. Horns recurvate, roundish, annulate, body bluish. Inhabits the Cape of Good Hope, larger than the deer, body beneath white, under the eye and on the foot a white blotch, tail seven inches, white, a little tufted at the tip, horns twenty inches long, rings twenty, tip smooth, hair long.

**ANTELOCAN**, in ecclesiastical writers, is applied to things done in the night, or before day.

**ANTELUDIA**, in antiquity, a day of parade preceding the circenses.

**ANTEMERIDIAN** A Before noon.

**ANTEMETICS** (from *anti* and *meto*, to vomit.) Medicines which relieve vomiting.

**ANIEMURAI** (from *ante*, and *murus*, wall.) In middle age writers, denotes a kind of outer wall environing the other walls and works of a place, and preventing the too near access of the enemy to them.

**ANIENATI**, in modern English history, is chiefly understood of the subjects of Scotland, born before king James the First's recession to the English crown, and alive after it. In relation to these, those who were born after the accession were denominated postnati. The antenati were considered as aliens in England, whereas the postnati claimed the privilege of natural subjects.

**ANTENCLIMA**, *αντικλημα*, in oratory, is where the whole defence of the person accused turns on criminating the accuser. Such is the defence of Orestes, or the oration for Milo. Occisus est sed latro. Γασκetus sed raptor.

**ANTENICFNL**, in ecclesiastical writers, denotes a thing or person prior to the first council of Nice.

**ANIFNNA**, **ANTEANNAS**, the horn-like processes projecting from the head of insects.

**ANTENOR**, a Trojan prince related to Priam. It is said, that during the Trojan war, he always kept a secret correspondence with the Greeks. In the council of Priam, Homer introduces him as advising the Trojans to restore Helen, and conclude the war. He advised Ulysses to carry away the Trojan palladium, and encouraged the Greeks to make the wooden horse, which, at his persuasion, was brought into the city of Troy by a breach made in the walls. Antenor has been accused of being a partner of his guilt. After the destruction of his country, Antenor migrated to Italy near the Adriatic, where he built Padua.

**ANTENUPIAL**, something that precedes marriage.

**ANTEPAGMENTA**, in ancient architecture, is used for the jambs of a door, lintels of a window, or carved ornaments of men, animals, &c. set upon the architraves.

**ANTEPENULTIMA**, or **ANTEPENULTIMATE**, in grammar, the third syllable of a word, reckoning from the latter end, or the last syllable except two. The word is compounded of the preposition *ante*, before, and *penultimate*, last but one, or *peneultima*.

**ANTEPHALTICS** (from *anti* and *phalax*,

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*the incubus, or night-mare*) Medicines which prevent this disease

**ANTEPILEPTICS**, in medicine, denotes a quality in remedies, whereby they prevent, diminish, or cure, epileptic fits

**ANIEPOSITION** (from *ante*, and *pono*, I place) A grammatical figure, whereby a word which by the ordinary rules of syntax ought to follow another, comes before it As when in the Latin the adjective is put before the substantive, the verb before the nominative case, &c

**ANIEPREDICAMENTS**, among logicians, certain preliminary questions which illustrate the doctrine of predicaments and categories

**ANTEQULRA**, in geography, a town of Spain, in the kingdom of Grenada, containing about 13,000 inhabitants, built by the Moors, on the ruins of the ancient Singilia, divided into parts or quarters, one of which is situated on a hill much above the rest, where are the castle and the houses of the nobility It is 20 miles NNW from Malaga, and 54 W from Grenada Lon 4 40 W Lat 37 6 N

**ANTERIDS**, in architecture, buttresses

**ANTERIOR AURIS** One of the common muscles of the ear, situated before the external ear It arises, thin and membranous, near the posterior part of the zygoma, and is inserted into a small eminence on the back of the helix, opposite to the concha, which it draws a little forwards and upwards

**ANTERIOR INTERCOSTAL NERVE** Splanchnic nerve A branch of the great intercostal that is given off in the thorax

**ANTERIOR MALLEI** See LAXATOR TYMPANI

**ANTERIOR a** Going before

**ANTEROS** (*αντις*, *against* love) A son of Mars and Venus He did not, as the nine imports, preside over an opposition to love, but he was the god of mutual love, &c Venus had complained to Themis, that her son Cupid always continued a child, and was told, that if he had another brother, he would grow up in a short space of time As soon as Anteros was born, Cupid felt his strength increase, and his wings enlarge, but if ever his brother was at a distance from him, he found himself reduced to his ancient shape From this circumstance it is seen, that return of passion gives vigour to love They were always printed in the Greek academies, to inform the scholars that it is their immediate duty to be grateful to their teacher, and to reward their troubles with love and reverence

**ANTES**, in architecture See ANFÆ

**ANTESFARI**, in Roman antiquity, signifies to bear witness against any one who refused to make his appearance in the Roman courts of judicature, according to the tenor of his bail The plaintiff, finding the defendant after such a breach of his engagement, was allowed to carry him into court by force, having first asked any of the persons present to bear witness The person so asked expressed his consent by turning his right ear, which

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was instantly taken hold of by the plaintiff, and this was to answer the end of a subpoena

**ANTSTOMACH** (from *ante* and *stomach*) A cavity that leads into the stomach.

**ANTHELION** See HALO and PARHELION

**ANTHELIX**, in anatomy, the inward protuberance of the external ear, being a semi-circle within, and almost parallel to the helix

**ANIHELMIA**, Indian pink See SPICE-LIA

**ANTHELMINTICS**. (*anthelmintica*, *se medicamenta*, *ανθελμιντικα*, from *anti*, *against*, and *helms*, *a worm*) Anthelmintics Medicines which procure the removal of worms from the human stomach and intestines This class of medicine comprehends four orders 1 Venous anthelmintics, as mercurial preparations, tin, and sulphur, which are principally adapted to strong and robust habits, those in the prime of life, and where there is a degree of torpor of the intestines 2 Lubricating anthelmintics, as common and linseed oil, which are best calculated for reduced habits. 3 Ionic anthelmintics, as sabina, tanacetum, and santonium, which are principally adapted for children and delicate habits 4 Cathartic anthelmintics, as scammonium, jalappa, aloë, and gambogia The constitutions in which these are to be preferred are the strong and robust, and those in the prime of life

**ANTHEM** (from *anti*, and *hymnos*, *a hymn*) A church-song performed in cathedral and other service, by the choristers, divided for that purpose into choruses, who sing alternately The word was originally used both for psalms and hymns, when thus performed

At present, the term is used in a somewhat narrower sense, being applied to certain passages taken out of the Psalms, &c and often accommodated to the particular solemnity in hand Anthems were first introduced into the reformed service of the English church in the beginning of the reign of queen Elizabeth

**ANTHEMIS** (from *ανθος*, *a flower*) Chamomile a genus of the class and order syngenesia polygamia superflua Receptacle chaffy, seeds generally crowned with a slight border, calyx hemispherical, nearly equal, florets of the ray more than five, oblong Thirty-nine species, chiefly natives of the south of Europe and the Barbary coasts five are indigenous to our own country, the *a. maritima*, *a. nobilis*, *a. arvensis*, *a. cotula*, *a. tinctoria*

**ANTHEMIS COTULA** (*cotula*, a dim of *cos*, a whetstone, so called from its leaves resembling a whetstone) The systematic name for the plant called cotula foetida in the pharmacopœias See COTULA FOETIDA

**ANTHEMIS NOBILIS** The systematic name for the chamœmelum of the shops. See CHAMÆMELUM

**ANTHEMIS PYRETHRUM** The plant is so called from which we obtain the pyrethrum of the pharmacopœias See PYRETHRUM

**ANTHER** (*ανθηρα* *anthera*) Apex of Ray, capsula staminis of Malpighi Summit, semet, pendent, or tip, of Grew and other



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**English writers** *Pars floris gravior polline, quod maturum dimittit* or *foeta granulata polline, et haec fovilla* A part of the flower, big with pollen or farina, which it emits or extrudes when ripe or, big with granulated pollen, and that with fovilla Or, it may be defined to be a vessel destined to produce and emit a substance for the impregnation of the germ. It forms a part of the stamen, and is placed on the top of the filament

There is generally one anther to each filament, in cucurbita, however, there is one to three; and in the class syngenesia, one to five filaments In mercurialis we find two, in fumaria three, anthers to a filament, in bryonia, five to three filaments, in theobroma, five to each In some flowers anthers are regularly wanting on one or more of the filaments as in chelone and Martynia, one—in pinguicula and verbena, two—in gratiola, bigaonia, and some geraniums, three—in curcuma, four—in pentstemon and other geraniums, five. These are called barren filaments

**Anthers are connected**

By the base, in most flowers By the top, in colchicum By the side, in canna, amomum By the nectary, in costus

**Their situation is**

On the top of the filaments, in most flowers On the side, in Paris and asarum On the pistil, in aristolochia On the receptacle, in arum, anonua

**They burst**

On the side, in leucocorum, and most flowers At the top, in galanthus and hyggelaria From the base upwards, in epimedium and leontice

**They are**

Distinct, separate, not cohering Globularia —Connate, coalescent, united Solanum, symplocaria —Twin (didymæ), swelling outwards with two knots Boerhaavia, salicornia, blitum, ammannia, potamogeton

Upright, pointing upwards Salicornia, ligustrum, olea, chionanthus, verbascum, tulipa —Incumbent, horizontal, and then versatile, being fixed only in the middle so as to move freely Gladiolus, globularia, dipsacus, scabiosa, passiflora

Exsert, or standing out or beyond the corolla, in some species of erica —Included, or enclosed within it Jasminum, styriga, priuula

**Awned, ending in an awn, in some species of erica** —Horned (bicornes), cloven at the tip, and the clefts spreading like horns, in some species of erica, andromeda, pyrola —Crested, terminating in a crest, in some species of erica

**Their figure is**

Oblong, in lilium, grasses Globular, in mercurialis Sagittate, or shaped like the head of an arrow, in crocus, nolana, soldanella, dodecatheon verum, humm, bromelia Angular, in tulip Horned, in hamamelis, erica, valerianum, pyrola Forked (bifurcatæ), in most grasses Linear, in hahocarpus, stapelia, calceolus, coffea, lysodendrum, magnolia Umbonate, or awl-shaped, in reolia, cornus

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Lanceolate, or shaped like the head of a spear, in banksia Hastate, or shaped like the head of a halbert, in Jacquinia Cordate, or heart-shaped, in capraria, unus, bucida, malpighi, thea Reniform, or kidney-shaped, in gnomia, tradescantia, and the class monadelphia Ovate, or egg-shaped, in limeum, gladiolus, comacina, convolvulus Three-cornered, (trigona), in rosa Four-cornered (tetragona), in cannabis, populus, dictamnus, cestrum, arum, cannabis Lunular, or shaped like a crescent, in fragaria, comarum Spiral, or twisted like a screw, chironia

**They have only**

One cell, in mercurialis Two cells, in epimedium, asclepias, daphne, helleborus Three cells, in orchis Four cells, in fritillaria, tropaeolum, pæonia, salix

**ANTHERICUM** Spider-root a genus of the class and order hexandria monogynia Corol six-petalled, spreading, permanent filaments filiform, capsule superior seeds angular, calyxes There are fifty-four species, almost all of them Cape plants The a serotinum, however, is also found on the Welsh mountains, but is the only species indigenous to Britain They may be divided into those, 1 with leaves channeled, filaments mostly bearded 2 leaves fleshy, bearded filaments 3 stamens dilated in the middle, root bulbous

**ANTHERIUM** In botany, a genus of the class and order icosandria monogynia Calyx inferior, four-parted, petals four, capsule one-celled, three-valved, many-seeded The only known species is a tree in St Thomas's island

**ANTHESPHORIA**, an ancient Sicilian festival, in honour of Proserpine

**ANTHESTERIA**, in antiquity, a feast celebrated at Athens in honour of Bacchus

**ANTHESTERION**, in ancient chronology, the sixth month of the Athenian year It contained twenty nine days, and answered to the latter part of our November and beginning of December

**ANTHINE**, among ancient naturalists, an appellation given to certain species of wine and oil

**ANTIISTRIA** In botany, a genus of the class and order polygynia monacell Herm, florets sessile, male florets pedicelled Calyx, glume four-valved, three or four flowered coriaceous, corol, glume two valved, awnless, filaments three, styles two, stigmas clavate, seed one One species alone, the aciliata, of Indian growth

**ANTHOCHROS** In botany, a genus of the class and order cryptogamia hepaticæ Male calyx six-parted, or entire, anthers from three to eight, obovate, at the bottom of the calyx Four species, of which two are natives of our own wastes and commons

**ANTHOLOGY** (ανθο λογία ) 1 A collection of flowers. 2 A collection of devotions 3 A collection of poems

**ANTHOLOMA** In botany, a genus of the class and order polyandria monogynia Calyx from two to four-leaved, corol cup-



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shaped, capsule? four-celled, many-seeded The only known species is a shrub of New Caledonia

**ANTHOLYZA** In botany, a genus of the class and order triandria monogynia Corol tubular, six cleft, unequal, recurved, capsule inferior Six species, all natives of the Cape generally with red or scarlet corols, and mostly very elegant

**ANTHONII SANCTUS IGNIS** The erysipelas, or ignis sacer of the Romans called St Anthony's fire, because he was supposed to be endowed with a miraculous power of curing it He is yet addressed in the Roman missals as the preserver from all sorts of fire

**ANTHONY** (Knights of), an order of knighthood, established in 1382, by Albert of Bavaria, &c who had then taken a resolution to make war against the Turks The knights of this order wore a collar of gold, with a hermit's grille, to which hung a crutch and a little bell Some authors mention another order of St Anthony in Lithuania, instituted in 170, by Prester John

St Anthony also gives the denomination to an order of religious founded in France about the year 1009, under the pontificate of Urban II to take care of those afflicted with St Anthony's fire

**ANTHOPHYLLI** (*anthophyllus*, *ανθοφυλλον*, from *ανθος*, a flower and *φυλλον* a leaf, so called from the fragrance of the flowers and the beauty of the leaves) Cloves are so termed when they have been sufficed to grow to maturity

**ANTHROPOLOGY** (*ανθρωπολογια*, and *λογια*) The doctrine of the form and structure of man

**ANTHROPOMORPHITE** (*ανθρωπομορφος*) One who believes a human form in the deity (*Idol*)

**ANTHROPOPATHY** (*ανθρωποπαθεια*, and *παθεια*) The passions of man

**ANTHORA** (*quasi antithora*, *ανθωρα* from *αντι* against, and *θωρα*, monkhood, so called because it is said to counteract the effects of the thoria or monkhood) Wolfbane The root is the part of this plant (*aconitum anthora*, floribus pentagonis, foliis ovatis linearibus of Linnaeus), which is employed medicinally Its virtues are similar to those of the *aconitum*, see **ACONITUM**

**ANTIHRISMUS**, in rhetoric, denotes a contrary description or definition of a thing from that given by the adverse party Thus, if the plaintiff urge, that to take any thing away from another without his knowledge or consent, is a theft, this is called *opos*, or definition If the defendant reply, that to take any thing away from another without his knowledge or consent, provided it be done with design to return it to him again, is not theft; this is an *ανθορισμος*

**ANTHOS**, **ANTHUS** (from *ανω*, upwards, and *τινω*, to run) 1 The anther, or uppermost part of the stamen of a flower 2 The entire flower, or corol itself 3 The floescent parts or flowers of minerals 4 The aroma or fine volatile parts, or essences of spirits and other chemical preparations

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**ANTHOSPERMUM** Amber tree a genus of the class and order diacia tetrandria Calyx four parted, corolless Fem pistils two, germ inferior, four-sided Three species, natives of Africa two of them of the Cape

**ANTHOXANTHUM** Vernal grass a genus of the class and order diandria digynia Calyx, glume two valved, one-flowered, corol, glume two-valved, pointed, awned, seed one Four species, of which the *a odoratum* is common to our own meadows, and chiefly gives the fragrance to our new-mown hay, the *a secundum* of Millibar resembles an *avicia*

**ANTHRACIA**, **ANTHRAX** (*ανθραξ*, a burning coal) Carbunculus A hard and circumscribed inflammatory tubercle like a boil, which sometimes forms on the cheek, neck, or back, and in a few days becomes highly gangrenous It then discharges an extremely fetid sanies from under the black core, which, like a burning coal continues to destroy the surrounding parts It is supposed to arise from a peculiar miasma, and is most common in warm climates

**ANTHRAX**, a tribe, or family of the genus bombilus See **BOMBILUS**

**ANTHRENNUS** In zoology, a genus of the class and order insect coleoptera Antennas clavate the club solid, feelers unequal, filiform, jaws membranaceous linear, bifid, lip entire head hid under the thorax Thirteen species all inhabitants of the continent of Europe except *a serricornis* and a *denticornis*, both of which are residents in Santa Cruz

**ANTHRIBUS**, a tribe of Fabricius See **CURCULIO**

**ANTHRISCUS**, in botany See **CHÆROPHYLLUM**

**ANTHROPOGLOTTUS**, among zoologists, an appellation given to such animals as have tongues resembling those of mankind, particularly the parrot kind

**ANTHROPOLATRÆ**, in church history, an appellation given to the Nestorians, on account of their worshipping Christ, notwithstanding that they believed him to be a mere man

**ANTHROPOLITES**, a term denoting petrifications of parts of the human body, as those of quadrupeds are called *zoolites*

**ANTHROPOITHUS** In orycthology a genus of the class petrifications, consisting of the human body, or some of its parts, changed into a fossil substance Two species have been found

1 *A totalis* Petrified entire skeleton (*Zoolitus hominis* of Linnaeus Syst Nat), discovered at Falkun in Sweden, imbedded in a mass of sulfuret of iron, or pyrites, and (as is asserted) converted into a hard stone in the year 1585 discovered also in some mineral waters in France, and in others near Freyburg in Saxony

2 *A partialis* Petrified cranium, or other bones a specimen of the former of which has been found in the mountains near Rheims in France

**ANTIROPOMORPHISM**, among eccle

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siastical writers, denotes the heresy or error of the Anthropomorphites

**ANTHROPOMORPHITES**, in church history, a sect of ancient heretics, who, taking every thing spoken of God in Scripture in a literal sense, particularly that passage of Genesis in which it is said, God made man after his own image, maintained that God had a human shape. They are likewise called Audicans, from Audeus their leader

**ANTHROPOPHAGI** (from *ανθρωπος*, a man, and *φαγω*, to eat) Men-eaters. That there have been, in almost all ages of the world, nations who have followed this barbarous practice, we have abundance of testimonies. The Cyclops, the Lestrygons, and Scylla, are all represented in Homer as anthropophagi, or men-eaters. According to Herodotus, among the Essedonian Scythians, when a man's father died, the neighbours brought several beasts which they killed, mixed up their flesh with that of the deceased, and made a feast.

Of the practice of anthropophagy in later times, we have the testimonies of all the Romish missionaries who have visited the internal parts of Africa, and even some parts of Asia. Dr Hawkesworth's Account of the Voyages to the South Seas renders it pretty certain, that the inhabitants of the island of New Zealand, a country unfurnished with the necessaries of life, eat the bodies of their enemies.

The annals of Milan furnish an extraordinary instance of anthropophagy in a Milanese woman, who had in invincible inclination to human flesh, which she gratified by enticing children into her house, where she killed and salted them. A discovery of this having been made, she was broken on the wheel and burnt in 1519.

**ANTHROPOPHAGINIAN** *s* A ludicrous word, formed from anthropophagi (*Sh*).

**ANTHROPOPHAGY** *s* (*ανθρωπος* and *φαγω*) The quality of eating human flesh (*Brown*).

**ANTHROPO'SOPHY** *s* (*ανθρωπος* and *σοφια*) The knowledge of the nature of man.

**ANTHROPOTHYSIA**, the ancient horrid practice of offering human sacrifices.

**ANTHYLLIS** Kidney-vetch, or lady's-finger, a genus of the class and order diadelphia decandria. Calyx inflated, legume roundish, invested with the calyx, stamens all united at the base. Twenty-one species, some herbaceous, some shrubby. chiefly natives of Africa or the south of Europe. The *vulneraria* is the only vetch indigenous in our own country. it is a triennial, with bright scarlet flowers. The rest are most of them cultivated in our gardens for their beauty.

**ANTHYPNOTICS** (from *αντι* and *υπνος*, sleep) Medicines that prevent drowsiness, or coma.

**ANTHYPOPHORA** *s* (*ανθυποφορα*) A figure in rhetoric, which signifies a contrary allusion, or inference (*Smith*).

**ANTI** (*αντι*) A particle much used in com-

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position with words derived from the Greek, which gives them in opposite meaning to their original as antisthmatics, or antasthmatics antihysterics, or antihystericis, &c medicines against asthma, hystericis, &c

**ANTICID** *a* (from *αντι* and *acidus*, sour) Contrary to sourness, alkaline (*Antibutnot*).

**ANTIARES** (from *αντι* and *αρης*, to meet against, or oppose) The tonsils, from their antagonist position to each other.

**ANTIBACCIIUS**, in ancient poetry, a foot consisting of three syllables, the two first long, and the last short, such is the word *ainbire*.

**ANTICARDIUM** (from *αντι*, against, or opposite, and *καρδιον*, the heart) The hollow at the bottom of the breast the pit of the stomach.

**ANTICHAMBER** See **ANTECHAMBER**.

**ANTICHOORUS** In botany, a genus of the class and order octandria monogynia. Calyx four leaved petals four, capsule superior, subulate, four-celled, four-valved, seeds numerous. The only known species is a native of Africa.

**ANTICHRISIS** (from *αντι* and *χριστις*, from *χρισμαι*, *to anoint*) In the civil law a covenant, or convention, whereby a person borrowing money of another engages or mortgages over his lands or goods to the creditor, with the use and occupation thereof, for the interest of the money lent. This covenant was allowed of by the Roman, among whom usury was prohibited. it was afterwards called mort gage, to distinguish it from a simple engagement, where the fruits of the ground were not alienated, which was called *vil gage*.

**ANTICHRIST**, in a general sense, denotes an adversary of Christ, or one who denies that the Messiah is come. The word is compounded of *αντι* contra, against, and *χριστος* Christ. In this sense, Jews, Infidels, &c may be said to be Antichrists.

**ANTICHRIST** is more particularly used for a tyrant who is to reign on earth, toward the end of the world, to make the ultimate proof of the elect, and to give a shining instance of the Divine vengeance, before the last judgment.

The Bible and the fathers all speak of antichrist as a single man, though they assure, withal, that he is to have divers precursors, or fore-runners. Yet many protestant writers apply to the Romish church, and the pope, who is at the head of it, the several marks and signatures of antichrist enumerated in the Apocalypse, which would rather imply antichrist to be a corrupt society, or a long series of persecuting pontiffs, than a single person. Or rather, a certain power or government, that may be held for many generations, by a number of individuals succeeding one another. The antichrist mentioned by the apostle John, 1 Ep ii 18 and more particularly described in the book of Revelations, seems evidently to be the same with the Man of Sin, &c characterized by St. Paul in his Second Epistle to the

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Thessalonians, ch 11 And the whole description literally applies to the excesses of papal power Had the right of private judgment, says an excellent writer, been always adopted and maintained, antichrist could never have been, and when the sacred right comes to be universally asserted, and men follow the voice of their own reason and consciences, antichrist can be no more

However the point having been maturely debated at the council of Gap, held in 1603, a resolution was taken thereupon, to insert an article in the confession of faith, whereby the pope is formally declared to be antichrist — Pope Clement VIII was stung to the life with this decision, and even king Henry IV of France, was not a little mortified, to be thus declared, is he said, an imp of antichrist

For an interesting account of the various opinions on this subject, see bishop Newton on the Prophecies, Disserta 22 See also Keitt on Prophecy

**ANTICHRISTIAN** *a* (from *anti* and *christian*) Opposite to christianity (*South*)

**ANTICHRISTIANISM** *s* (from *anti-christian*) Opposition or contrariety to Christianity (*Decay of Pity*)

**ANTICHRISTIANITY** *s* (from *anti-christian*) Contrariety to Christianity

**ANTICLIPION** in the Pythagorean philosophy, denoted a globe similar to the earth, and like it supposed to move round the sun, but invisible to us, because always on the opposite side of the luminary This figured body in dlc up the desired number of ten spheres

**ANTICLIPIONES**, was used by ancient geographical writers in two senses 1 To denote those inhabitants of the earth which we now call antipodes 2 To denote the inhabitants of contrary hemispheres

**To ANTICIPATE** *v a* (*anticipo*, Lat) 1 To take something sooner than another, to take first possession (*Hammond*) 2 To take up before the time (*Dryden*) 3 To foretaste or take an impression of something, which is not yet, as if it really was (*Denham*) 4 To preclude (*Shakspeare*)

**ANTICIPATION** *s* (from *anticipate*) 1 The act of taking up something before its time (*Holder*) 2 Foretaste (*Elstrange*) 3 Opinion implanted before the reasons of that opinion can be known (*Derham*)

**ANTICIPATION**, in music, is when a diminutive note lies between two other notes, and was invented with a view to vary the melody without altering the intention when it is made with a beat or a shake and swelling the sound, it will have greater effect

**ANTICK** *a* (*antiquus*, ancient) Odd, ridiculously wild (*Dryden*)

**ANTICK** *s* 1 He that plays anticks, or uses odd gesticulation, a buffoon (*Shakspeare*) 2 Odd appearance (*Spenser*)

**To ANTICK** *v a* (from *antick*) To make antick (*Shakspeare*)

**ANTICKLY** *ad* (from *antick*) With odd postures (*Shakspeare*)

**ANTICLIMAX** (from *anti* and *κλιμαξ*,

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*gradation*) In rhetoric, is a figure whereby the progress of a discourse descends from great to little, and this is sometimes rendered peculiarly agreeable by such a concord between the sense and sound as may contribute to make diminutions appear still more diminutive Horace affords a striking example Parturient montes, nascitur ridiculus mus

**ANTICOICA**, in the Materia Medica, medicines suited to cure the colic

**ANTICONVULSIVE** *a* (from *anti* and *convulsiv*) Good against convulsions (*Lloyer*)

**ANTI-COR** (from *anti*, in opposition to, and *cor*, the heart) A disease in horses, formerly supposed to reside in the heart itself, or the pericardium It is now, however, fully ascertained to be an inflammatory quinsy, or angina and should of course be attacked by purgatives, clysters, bleeding, and blisters, or stimulating cataplasms applied to the throat

**ANTICOSIA**, an island in the mouth of the river St Laurence, North America Lat. 49 to 52 N Lon 64 16 W

**ANTICOURTIER** *s* One who opposes the court

**ANTICUM**, in architecture, a porch before a door

**ANTICUS** *Scirpus minor* See **SER-RATUS**

**ANTICUS** (Poison us) See **PERONÆUS**

**ANTICUS** (Liberty) See **FIBALIS**

**ANTI-DACTYLUS**, a name to a foot of poetry the reverse of iambic, consisting of three syllables the first two short, and the last long

**ANTIDYSMIA** In botany, a genus of the class and order dicæta pentandria Calyx five-leaved, corollæless milk, anthers half-cloven Stem stigmas five, berry cylindric, one seeded Three species, all natives of China or the East Indies

**ANTIDICOMARIANITES** (from *avridino*, *adversary*, and *maria*, *Mary*) A sect of ancient Christians, who thought that the Holy Virgin did not preserve a perpetual virginity, but that she had several children by Joseph after our Saviour's birth

**ANTIDORON**, in ecclesiastical writers, a name given by the Greeks to the consecrated bread, out of which the middle part marked with the cross wherein the consecration resides, being taken away by the priest, the remainder is distributed after mass to the poor

**ANTIDOTAL** *a* (from *antidoti*) That has a power of counteracting poison (*Brown*)

**ANTIDOSIS**, in antiquity an exchange of estates, practised by the Greeks on certain occasions with peculiar ceremonies, and first instituted by Solon When a person was nominated to an office, the expense of which he was not able to support, he had recourse to the antidosis, that is, he was to seek some other citizen of better substance than himself, who was free from this and other offices, in which case the former was excused In case the person thus substituted denied himself to be richest, they were to exchange estates, after this manner the doors of their houses were close shut up and sealed, that nothing might

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be conveyed away, then both took an oath to make a faithful discovery of all their effects, and within three days an exchange of estates took place

**ANTIDOTE** (*antidotus*, *antídōtos*, from *anti*, against, and *idōmi*, to give) A remedy A medicine which possesses the property of expelling the mischiefs of another, as of poison

**ANTIPIBRILL** a (*αντι* and *febris*) Good against fevers (*flower*)

**ANTIGONE** a daughter of Œdipus, king of Thebes, by his mother Jocasta She buried by night her brother Polynices, against the positive orders of Creon who, when he heard of it, ordered her to be buried alive She however killed herself before the sentence was executed, and Hæmon the king's son, who was passionately fond of her, and had not been able to obtain her pardon, killed himself on her grave The death of Antigone is the subject of one of the tragedies of Sophocles The Athenians were so pleased with it at the first representation, that they presented the author with the government of Sinus This tragedy was represented thirty-two times at Athens without interruption *Sophocles*

**ANTIGRAPHIE**, in antiquity, a law suit about kindred

**ANTIGRAPHUS** in antiquity, has various meanings 1 An officer of Athens who kept a check on the chief treasurers account 2 In middle age writers, a secretary, or chanceller 3 An abbreviator of the pipil letters 4 A character used to denote a diversity of sense in translations

**ANTIGUA** See ANTEGA

**ANTIUGUIR** See SIPHON

**ANTILEGOMENA**, in Scripture criticism, an expression denoting doubtful but acknowledged by most to be genuine, one of the three classes into which Fuscibus has distributed the books of the New Testament the other are homologoumena, i. e. of undoubted authority, and nothi or spurious

**ANTILLES**, the French name for the Caribbees

**ANTILOBRIUM** (from *anti*, and *lobo*, the bottom of the ear) Thetragus, of that part of the ear which is opposite the lobe

**ANTILOGARITHM**, the complement of the logarithm of a sine, tangent, secant, &c. to that of the radius This is found by beginning at the left hand subtracting each figure from 9, and the last figure from 10

**ANTILOGY**, in matters of literature, an inconsistency between two or more passages of the same book

**ANTILOPE**, in zoology See ANTELOPE

**ANTILUTHERANS** a sect or party among the ancient reformers, who maintained opinions, chiefly in relation to the eucharist, different from those of Luther

**ANTILYSSES** (*antilysses*, *antilysses*, from *anti*, against, and *lyssa*, the madness caused by the bite of a mad dog) Medicines against the bite of a mad dog

**ANTIMENSUM**, a consecrated table-

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cloth, sometimes used in the Greek church where there is no altar Sometimes this name is given to a portable altar

**ANTIMENSUS**, an officer in the ancient Greek church who placed the communicants in proper order

**ANIMIRIA**, in grammar, a figure whereby one part of speech is used for another e. g. *velle suum cuique est*, for *voluntas sua cuique est*, also, *populus hinc rex*, for *populus hinc regnans*

**Antinertia**, in a more restrained sense is a figure where the noun is repeated instead of the pronoun

**ANIMETABOLE** in rhetoric a figure which sets two things in opposition to each other The word is compounded of *anti*, against, and *μεταβαλλω*, I shift or transfer, i. e. shifting or setting two things over against each other This figure is twice exemplified in an epiphrama of Maronius which on account of its excellence, is called *aureum monitum*, the golden maxim or precept

*Αντιπαλὴν καλὸν μεταπαλιν ποιοῦσιν οὐκ ἐστὶν ἀντιμεταπαλιν ποιοῦσιν*

*Αντιπαλοῦσιν ἀντιπαλοῦσιν μετὰ τὴν τὴν μετὰ τὴν οὐκ ἐστὶν ἀντιπαλοῦσιν μετὰ τὴν*

In English thus

“Allowing the performance of an honourable action to be attended with labour the labour is soon over, but the honour immortal whereas should even pleasure wait on the commission of what is dishonourable the pleasure is soon gone, but the dishonour eternal”

**ANTIMETABOLIS** in rhetoric, is the inversion of the parts or members of an antithesis

**ANIMETTER**, or **REFLECTING SECTOR**, an instrument invented by Mr. GRAY calculated for measuring small angles with greater accuracy than by the sextant or other instruments commonly used

The frame of it is similar to that of HADLEY'S quadrant, having two radii, a limb and bristles but with this difference, that the further radius is produced upwards of four inches beyond the centre of motion of the index, and the great speculum, or what is called the index-glass in HADLEY'S quadrant, being placed there is called the upper centre In this instrument there is no provision for the back observation

**ANIMISUM**, in antiquity, a table placed before the Roman tribunal, or judgment-seat

**ANTIMONARCHICAL** a (*anti* and *μοναρχία*) Against government by a single person (*Addison*)

**ANTIMONIAI** a (from *antimony*) Made of antimony (*Blackmore*)

**ANIMONIUM** (*antimonium*, *antimonium*) The origin of this word is very obscure The most recent etymology is from *anti*, against, and *μοναχός*, a monk, because Valentine, by an injudicious administration of it, poisoned his brother monks See STIBIUM, and ANTIMONY

**ANTIMONIUM CALCINATUM** Calc ant-

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**Antimonium diaphoreticum** This preparation of antimony, termed oxydum stibi album, in the new chemical nomenclature, is greatly fallen into disuse. Its virtues are diaphoretic and alterative.

**ANTIMONIUM MURIATUM** Butyrum antimonii. Causticum antimoniale. Butter of antimony. This preparation of antimony, called in the new chemical nomenclature murus stibi hypoxygentu, is employed to destroy wart, carcinomatous excrescences, staphyloma, &c.

**ANTIMONIUM TARTARISATUM** Tartarus emeticus. Tartarus antimonialis. Tartar emetic, given in small doses, is nauseating, cathartic, sudorific, deobstruent, and in large modic promoting absorption. Internally it is exhibited in bilious fevers, foulness of the stomach, rheoedent and tonic exanthemat, abdominal phlogoma, tumour of the testicle, priapism, anurosis, pituitous discharges of the lungs, rheumatism, and comatose diseases. When given in very small doses, so as to create nausea, it is recommended in tibia, laxation and incarcerated hernia. Externally in the form of powder or dissolved in water, it is applied by a pencil to warts and obstinate ulcers. It is also given in the form of elycter, with a view to produce irritation in soporose diseases, apoplexy, ileus, and hernia incarcerated. The powder mixed with saliva, and rubbed on the erubriculus cordis, excites vomiting. The best antidote against the bad effects of too large a quantity of this and other antimonial preparations, is a decoction of the bark of cinchona.

**ANTIMONIUM VITRIFICATUM** Glass of antimony. See ANTIMONY.

**ANTIMONY** a metallic substance of a greyish white colour, considerable brilliancy, and strongly resembling tin, or silver. Its texture is laminated, and the laminae appear arranged one over another and crossing, in every direction its surface often exhibits a kind of crystals in the form of stars or fern leaves. It is very brittle, and easily pulverized, melts, when heated just to reduce, it about 810 deg. Fahrenheit, evaporates, if the heat be increased, communicates to the fingers a peculiar taste and smell when rubbed upon them. Its specific gravity varies from 6.702 to 6.80. The substance to which this name has been commonly, though erroneously, applied, is a mineral, or ore of antimony, composed of a mixture of sulphur with this metal, and it is accordingly, in the language of modern chemistry, denominated sulphuret of antimony. Some account of its properties is distinguished from the metal, will be found in the next article. The pure metal, of which we are now treating, was called regulus of antimony.

Of the ores from which antimony is extracted, there are various kinds, composed chiefly of that metal and sulphur in different proportions, occasionally mixed with other metals, as lead and iron, and sometimes with arsenic, beside the usual stony or earthy matters which form the gangue, or matrix of the

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ore. In the examination of ores which are suspected to contain antimony, its presence is detected either by the blow-pipe on charcoal, when they exhale a dense smoke of a white or yellowish colour, and deposit yellowish flowers, or white needle-form crystals on the surface of the charcoal, or more certainly, by reducing 200 grains of the ore to fine powder, and digesting it slowly for an hour in a moderately diluted nitro muriatic acid, in which the nitrous is not more than one-third of the muriatic part, the clear liquor is then to be decanted, evaporated to about half its bulk, and poured into a large quantity of distilled water, when, if the metal be present, a copious white precipitate of its oxyd immediately takes place. If this oxyd be calcinated and mixed with an equal weight of crude tartar and put into a small lined crucible fitted with a cover, a moderate red heat will reduce it to a metallic button.

The only ore of antimony which is found in sufficient abundance for the purpose of manufacture is the grey or sulphurated, and this is easily reduced. After picking out the larger pieces of the gangue the remainder is coarsely bruised, and put into crucibles having small holes in their bottom, and inserted into other crucibles, or connected with them by means of pipes. These are arranged in furnaces on stages rising one above another like stairs. As the mass fuses very readily, a low red heat is at first applied, and the sulphurated metal descends through the hole into the lower crucibles, leaving the impurities behind. A more simple and economical practice has been established in Hungary and France instead of employing separate crucibles, the whole mass of ore is melted together in a reverberatory furnace the surface of the metal being kept covered with charcoal to prevent oxydation, and when in a state of fusion, is drawn off into the receptacle by the removal of a plug. The substance obtained by these methods is not pure metal but sulphuret of antimony, and being melted and cast into loaves or cakes forms the common or crude antimony of commerce.

It is from the sulphurated ore, reduced as above, that the pure antimony is obtained, either by roasting by scorification, or by what is called dry parting or precipitation.

In the first method, the sulphuret is pulverized, and spread thinly on the floor of a reverberating furnace or muffle, to be freed from its sulphur. The degree of heat necessary for this purpose is not very great, and is indicated by the fumes of sulphur becoming visible in the form of a lambent blue flame. By a continuance and occasional increase of the heat, an ash-grey oxyd of antimony is obtained, which being mixed with half its weight of crude tartar, and exposed in a covered crucible to a full red heat, yields, if the process be carefully managed, nearly three fourths its weight of pure antimony.

The second method, on account of its expedition, is generally preferred in the laboratory,

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though it be more expensive and less accurate than the former. It consists, usually, in mixing four parts of crude antimony finely powdered, with three parts of tartar, and one and a half of nitre, and projecting the mixture by spoonful into a red hot crucible, till it be nearly filled, being then covered, and a full red heat applied for half an hour, the contents are either poured out into a greased iron cone, or suffered to cool in the crucible, by which means the metal, covered with a mass of saline scorise, is reduced to a state of purity.

In the third method, the reduction is effected by fusing the sulphuret with any other metal whose affinity for sulphur is greater than that of antimony, in which case the sulphur combines with the added metal, and the antimony is precipitated in a button. There are several metals fitted for this purpose, but the only one now employed is iron, and the metal obtained by its use has been called martial regulus of antimony. Horse-shoe nails are generally used, because the iron of which they are made is of the kind most proper to combine with the sulphur, and to separate it from the antimony. This method will not, like the two former, afford the metal in a state of absolute purity, as a small quantity of the iron remains in combination with it.

Antimony, on exposure to the air, suffers no change except the loss of its lustre: neither is it altered by being kept under water, but when it is made red hot, and steam passed over it, it is decomposed with a violent detonation.

This, like most of the other metals, combines with oxygen in two different proportions, thereby forming two oxides of antimony. The first is obtained by dissolving the metal in muriatic acid, and diluting the solution with water, the precipitate which takes place is the oxide united with a little muriatic acid, which is separated from it by washing and then boiling for some time in a solution of carbonate of potash. The second is produced by exposing the antimony in the open air to a violent heat on its alkali fire, a white oxide is sublimed, formerly called argentine flower of antimony. It is obtained also by causing nitric acid to act upon the metal, and by throwing it into red hot nitre the potash which remains combined with the oxide is separated, by adding water to the compound which dissolves a part of it, and on the addition of an acid the oxide is precipitated in the form of a white powder. The oxide obtained by nitric acid has been called diaphoretic, or white powder of antimony, that by muriatic acid, Algaroth's powder, and that by sublimation silver, or argentine flowers, as above.

All the acids, except the carbonic, dissolve the grey or imperfect oxide of this metal, the formation of which will be noticed in the next article. By combining with it acid of tartar, the well known salt is produced, anciently called emetic substat tartar, but now antimonial tartaric of potash.

The sulphuric acid, by boiling on pure antimony, is partly decomposed. Sulphureous gas

is first separated, and sulphur itself sublimes towards the end, an oxide is formed, as well as a small quantity of sulphur of antimony, which is very deliquescent, and easily decomposed.

It decomposes the nitric acid with great facility, part of the antimony is oxidized, forming the bezoar mineral, and a portion is dissolved, forming a nitrat of antimony, decomposable by heat, as  $\text{Antimony Nitrate}$ .

The muriatic acid acts on it only by a long digestion. The nitro-muriatic acid is its most convenient solvent. The solution has no colour. The oxy-muriatic acid possesses most equal powers: thus, two parts of the corrosive muriat of mercury and one of antimony being distilled together, a slight degree of heat drives over a butyraceous matter, the sublimed muriat of antimony, or butter of antimony, the acid, as in the corrosive muriat of mercury, being in an oxygenated state. The sublimed muriat of antimony becomes fluid by a very gentle heat and is thus easily poured from one vessel to another.

Diluted with water, a white oxide of antimony falls which is powder of Alquoith, or mercurius vitæ. Wine and the acetic acid dissolve it.

Antimony unites with sulphur very readily by fusion, forming a sulphuret of antimony, similar in its properties to the crude antimony obtained by smelting the several grey antimonial ores. It combines also with phosphorus, forming phosphuret of antimony.

Anciently this substance was employed chiefly, if not entirely in the composition of paint with which the ladies blackened their eyebrows, and it is several times mentioned in Scripture as such. Jezebel, understanding that Jehu was to enter Samaria, is represented to have painted her eyes, or as the Hebrew signifies "put her eyes in antimony." At this day the women of Syria, Arabia, and Babylon, anoint and blacken themselves about the eyes, and both men and women put black upon their eyes in the Desert, to preserve them from the heat of the sun, and the piercing of rays.

This metal is capable of uniting, and thereby forming alloys, with several of the other metals, but the greater part of these alloys have not been applied to any use. With gold it may be combined by fusion, forming a brittle compound of a yellow colour, and upon it is facility of combination a method has been founded, first by Basil Valentine, of refining gold by antimony. With platinum it unites easily, and the alloy is much lighter than platinum. With silver it combines readily by fusion, as it does with copper, iron, tin, lead, nickel, zinc, and bismuth. The alloy of antimony with copper is of a beautiful violet colour, that with tin is used for several purposes in the arts, particularly for making the plates on which music is engraved, that with lead is employed for making printers' types. The proportion of the metals is about four parts of lead to one of antimony, either

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with or without zinc or bismuth. Antimony does not amalgamate with mercury while cold, but when three parts of the latter are mixed with one of melted antimony, a soft amalgam is produced, which very soon decomposes of itself. Other properties of antimony, in its several combinations, will be seen in the next article.

These are the principal properties of this semimetal, but as its ore, sulphur of antimony, is commonly used in a great number of pharmaceutical preparations, it may not be unwise to remind the reader of this particular. Taken in a mortar to a powder, and levigated, with the addition of a little water, upon a hard and polished, but not cleareous stone, into as fine a dust as possible, and then dried, it forms the *antimonium præparatum*, or *sulphuretum stibi nigrum*, powdered, and burnt in an earthen vessel, until it no longer emits a sulphureous smoke, and then put into a covered crucible, and exposed to a strong heat, it melts, and forms the *antimonium vitrificatum*. Powdered and mixed with nitre, in the proportion of eight ounces to two pounds, and cast by degrees into a red hot crucible, and burnt for about half an hour, it affords the *antimonium calcinatum*, or *oxydum stibi album*. Similar to this preparation is the celebrated James's powder, as a substitute for which the London College have ordered the *pulvis antimonialis* (*phosphis calcis stibiatus*) made by throwing into a red hot pot an equal quantity of crude sulphur of antimony and hartshorn shavings, and agitating it until they become of an ash colour. The matter is then to be put into a crucible with another inverted upon it, and kept in a red heat for two hours. It is then to cool and be reduced to a fine powder. The *crocus* of antimony is prepared by mixing a pound of powdered antimony and nitre, and one ounce of sea salt, by degrees, into a red hot crucible, and melting them with an augmented heat, and when cold separating the scoria. If one pound of vitriolic acid be poured into a retort, and a mixture of one pound of this *crocus* of antimony, with two pounds of dry sea salt, be added by degrees thereto and distilled in the same bath, the product is the *murias stibi hyperoxygenatus*, called *antimonium murinum*, or butter of antimony, in the Lond Pharm. The *antimonium tartarisatum*, or tartarised antimony, *tartaris potasse acidulus stibitatus*, is made by boiling for about a quarter of an hour, a mixture of one pound and a half of the *crocus* with two pounds of crystals of tartar, and two gallons of water. The liquor is then to be filtered, and the strained liquor set by to crystallize. Besides these preparations there are the wine of antimony, and the tartarised wine. The former is made by digesting one ounce of powdered vitrified antimony with a pint and a half of Spanish white wine, the latter by dissolving two scruples of the tartarised antimony in two ounces of boiling water, and then adding eight ounces of Spanish white wine. With regard to the use of anti-

mony in medicine, it is very considerable, though not so general as in former times. Calcinated antimony is esteemed as an alterative and diaphoretic. Muriated antimony is employed by surgeons as a very powerful caustic for destroying warts and fungous flesh, and especially venereal excrescences. The prepared antimony is alterative and diaphoretic in small doses. *Antimonium tartarisatum* is used in common as a vomit in the dose of from one to four grains. Dissolved in water, and given with or without nitre, in the dose of an eighth of a grain every four hours, it cures inflammatory affections, as synocha, pleuritis, &c. acting as a very powerful diaphoretic. In pneumonia it is exhibited in nauseating doses as an expectorant. The vitrified antimony is emetic in the dose of from a quarter of a grain to a grain and a half. *Pulvis antimonialis*, supposed to be the same as James's powder, is given as a febrifuge in the dose of from three to five grains, and is a powerful diaphoretic. *Antimonium* wine in small doses, gut xx to xxx, is a febrifuge, diaphoretic, and alterative.  $\mathfrak{z}\text{ij}$  to  $\mathfrak{z}\text{ss}$  proves a useful emetic in hooping cough, &c. The tartarised antimonial wine is also emetic,  $\mathfrak{z}\text{ij}$  to  $\mathfrak{z}\text{iv}$ , and a good febrifuge and diaphoretic in doses of from fifteen to forty drops.

**ANTIMONY** (Sulphuret of), a substance composed of antimony and sulphur united, though it is commonly found native in the several ores of antimony. It is frequently known by the name of crude antimony, and was formerly called antimony, while the pure metal, in distinction from it, was termed regulus of antimony. See the last article. It is a mineral substance, of a darkish, or lead colour, full of long, shining, and needle-like striae, and considerably heavy. It may be prepared artificially, by melting in a low red heat, a pound of pulverized antimony with eighteen ounces of sulphur, a uniform mass is produced weighing about two pounds, and possessing all the properties of native sulphuret.

Crude antimony, coarsely powdered, and exposed in a shallow vessel to a slow heat, gradually loses its sulphur, and by imbibing oxygen from the atmosphere, is converted into a grey or imperfect oxide. Much care is necessary in this process: the powder should be diligently stirred with an earthen rod, and if any part of it concretes on account of too strong a heat, it ought to be taken out and powdered afresh before the roasting is continued. This oxide, if well prepared, and heated to redness in a crucible, is fused into a transparent glass, possessing, according to circumstances, every shade of colour from light yellow to the deepest hyacinthine red: this is the glass of antimony, or in modern language, vitreous sulphurated oxide of antimony, which, on being blended with wax, forms the cerated glass. If the glass happen to be opaque, and of a darkish colour, it is called liver of antimony, which name is also applied to a preparation of crude antimony and nitre.

In the second method mentioned in the pre-



reding article, of separating the pure metal from the crude antimony, it was stated that saline scoræ covered the metal when precipitated, these scoræ, on being dissolved in water, let fall a brown precipitate, or sulphurated oxide of antimony, long known by the name of *kermes mineral*. If an acid be added, the precipitate is of a finer, and at length of an orange colour, this last precipitate is the sulphurated oxide of antimony, but contains a larger proportion of sulphur than the former, and has obtained the name of golden sulphur of antimony. See *STIBIUM*.

**ANTINŒLIA**, in antiquity, annual sacrifices, and quinquennial games, in memory of Antinous the Bithyrian.

**ANTI-NOMIANS**, in church history, denote those who maintain the law of no use or obligation under the gospel dispensation, or who hold doctrines that clearly supersede the necessity of good works and a virtuous life. The antinomians took their origin from John Agricola about the year 1538, who taught that the law is no way necessary under the gospel, that good works do not promote our salvation, nor ill ones hinder it, that repentance is not to be preached from the decalogue, but only from the gospel.

This sect sprung up in England during the protectorate of Oliver Cromwell, and extended their system of liberalism much further than Agricola, the disciple of Luther. Some of their teachers profly maintained that since he elect cannot fall from grace, nor forfeit the divine favour, the wicked actions they commit are not really sinful, nor are to be considered as instances of the violation of the divine law, and that consequently they have no occasion either to confess their sin, or to break them off by repentance. According to them, it is one of the essential and distinctive characters of the elect, that they cannot do any thing which is either displeasing to God or prohibited by the law.

**ANTI-NŒUS**, in astronomy, a northern constellation, generally reckoned a part of aquila; the figure is that of a handsome youth. The stars in this constellation, arranged according to their magnitudes, are 60, 5, 2, 7, 20, in all 34.

**ANTIOCH**, formerly the metropolis of Syria, in Asiatic Turkey. The Turks have reduced this town almost to nothing, but its magnificent ruins still remain. This city stood on the river Orontes, about twenty miles from the place where it empties itself into the Mediterranean, being equally distant from Constantinople and Alexandria, in Egypt, that is, about 700 miles from each. Seleucus Nicator called it Antioch from his father's name, according to some, or from that of his son, according to others. He built sixteen other cities bearing the same name, of which one, situated in Phœnia, is probably that where the name of Christians was first given to the followers of Jesus Christ. But that situated on the Orontes by the eclipsed, not only all the others of this name, but all the cities built by

Seleucus Antigonus, not long before, had founded a city in that neighbourhood, which from his own name he had called Antiochia, and designed it for the capital of his empire, but it was razed to the ground by Seleucus, who employed the materials in building his metropolis, and also transplanted the inhabitants thither.

The city of Antioch was afterwards known by the name of Tetrapolis, being divided as it were into four cities, each of them being surrounded with its proper wall, besides a common one which inclosed them all. The first of these cities was built by Seleucus Nicator, as already mentioned, the second by those who flocked thither on its being made the capital of the Syro-Macedonian empire, the third by Seleucus Callinicus, and the fourth by Antiochus Epiphanes. About four or five miles distant stood a place called Daphne, which was nevertheless reckoned a suburb of Antioch. Here Seleucus planted a grove, and in the middle of it built a temple which he consecrated to Apollo and Diana, making the whole an asylum. To this place the inhabitants of Antioch resorted for their pleasures and diversions, whereby it became at last so infamous that, "to live after the manner of Daphne," was used as a proverb to express the most voluptuous and dissolute way of living. Here Lucius Verus, the colleague of M. Aurelius, chose to take up his residence instead of marching against the Parthians, while his general C. S. was forbid by proclamation any of his soldiers to enter or even come near the place. In short, so remarkable was Daphne of old, that the metropolis itself was distinguished by it, and called Antioch near Daphne. Lat. 35, 17 N. Lon. 36, 45 E.

**ANTIOCHUS**, a name common to eleven kings of Syria, the most celebrated of whom was Antiochus III. surnamed the Great, brother to Seleucus Cereus. He was defeated by Ptolemy Philopater at Raphia, after which he made war against Persia, and took Sardes. After the death of Philopater, he endeavoured to crush his infant son Euphrates, but his guardians solicited the aid of the Romans, and Antiochus was compelled to resign his pretensions. He conquered the greatest part of Greece, or which some cities implored the aid of Rome, and Annibal, who had taken refuge at his court, encouraged him to make war against Rome. He was glad to find himself supported by the abilities of such a general, but his measures being dilatory, and not agreeable to the advice of Annibal, he was conquered and obliged to retire beyond mount Taurus, and pay a yearly fine of 2000 talents to the Romans. His revenues being unable to pay the fine, he attempted to plunder the temple of Belus in Susiana, which so incensed the inhabitants that they killed him with his followers 187 years before the Christian era, after he had reigned 36 years. In his character of king Antiochus was humane and liberal, the patron of learning, and the friend of merit, and he published an edict, ordering his subjects never

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to obey except his commands were consistent with the laws of the country. He had three sons, Seleucus Philopater, Antiochus Epiphanes, and Demetrius. The first succeeded him, and the two others were kept as hostages by the Romans. Just I iv—They were all distinguished by the following surnames, Soter, Theos, The Great, Epiphanes, or illustrious, Lathicus, or noble, Sidelis, Grypus, Cyronicus, Pius and Asiaticus. This last being deposed by Pompey the Great, P C 65, Syria became a Roman province, and the race of Antiochus was extinguished.

**ANTIOCHUS I PIPHANES**, or the Illustrious, usurped the throne of Syria from his nephew Demetrius, 173 years before Christ, and attempted to take Egypt from his nephew Ptolemy Philometer, but was repulsed. He deposed Onias, the high-priest of the Jews, and besieged and took Jerusalem, 170 years before Christ, when he profaned the temple of God, offered sacrifices in it to Jupiter Olympius, carried away the sacred vessels, and committed the most horrid acts of cruelty. At his return to Antioch, 167 years before Christ, he put to death the seven brothers, the Maccabees, with old Eleazar. However, Matthias and Judas Maccabeus defeated his armies, and he himself was routed by the Glymeins, and obliged to return to Babylon, where he was seized with a dreadful disease, and died in the greatest inward agony, 164 years before the Christian era.

**ANTIPI DOBAPTISTS**, from *avri*, *against*, and *παιδες*, *child*, and *βαπτισμα*, *baptize*, whence *βαπτισμα*, is a distinguishing denomination given to those who object to the baptism of infants, because they say infants are incapable of being instructed, and of making that profession of faith which intitles them to this ordinance and an admission into the church communion. See **ANABAPTISTS** and **BAPTISTS**.

**ANTI PARALLELIS**, in geometry, are those lines which make equal angles with two other lines, but contrary ways, that is calling the former pair the first and second lines, and the latter pair the third and fourth lines, if the angle made by the first and third lines be equal to the angle made by the second and fourth, and contrariwise the angle made by the first and fourth equal to the angle made by the second and third, then each pair of lines are antiparallels with respect to each other, viz the first and second, and the third and fourth. So if AB and AC be any two lines, and EC and FE be two others, cutting them so, (pl 13 fig 3.)

that the angle B is equal to the angle E, and the angle C is equal to the angle D, then BC and DE are antiparallels with respect to AB and AC, also these latter are antiparallels with regard to the two former. It has been commonly asserted that each pair of antiparallels cuts the other into proportional segments, taking them alternately, but this is erroneous, for although

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AB AC AL AD, and EF EC EB ED, yet we cannot consistently with truth, say

AB AC AE AD DB EC and EF EC EB EF DE BC for the last proportions will appear to every one who examines them closely, to be absurd and contradictory. Instead, then, of the analogies which have been commonly given as applicable to antiparallels, we present the following, which are both curious and accurate.

AD<sup>2</sup> AC<sup>2</sup>—AD AD<sup>2</sup>—AE<sup>2</sup> LC<sup>2</sup>—DB<sup>2</sup> ED<sup>2</sup> EC<sup>2</sup>—ED ED<sup>2</sup>—EB<sup>2</sup> BC<sup>2</sup>—DE<sup>2</sup>

**ANIPARALYTICK** a (*avri* and *παρὰ*—*παρα*) I shewers against the palsy.

**ANTI PARASIASIS**, from *avri* and *παρὰ*—*παρὰ* of *παρρησις* *I exhibit*, in rhetoric, a reply made to an opponent, by allowing part of his argument and denying the rest.

**ANTI PAROS** one of the Greek islands in the Archipelago, about sixteen miles in circumference. In it is a remarkable grotto, much admired and spoken of by travellers, and by some produced in evidence of the vegetation of stones. It takes its name from its situation opposite Páros, from which it is only about four miles to the west.

**ANTI PATER**, son of Iolau, was a soldier under Philip, and raised to the rank of general under Alexander of Macedon. He was a pupil of Aristotle, and the faithful minister of Philip and Alexander. The former monarch once coming late to the levee, said, "I have slept sound this morning, but then I knew Antipater was waking." A person observing to Alexander that all his officers of state wore purple except this prime minister. "Yes (answered he), but Antipater is all purple within." While Alexander was abroad, he left Antipater in the government of Macedon, and by his prudent management he kept all Greece in order. On the death of his master, in the general distribution of his territories, Antipater obtained the European provinces. Not long after, the confederate states of Greece attacked him, but by his address and vigilance they were defeated, and he marched to Athens, which he took, and destroyed its democratic government. He did the same by the other states, on which he was called the father of Greece. His last advice to Polyperchon, whom he had chosen for his successor, was, "never to admit a woman to meddle in state affairs." He died B C 318, aged 80.

**ANTIPATHES** In zoology, a genus of the class and order vermes, zoophyta. Animal plant-form, stem expanded at the base, internally horny beset with small spines, externally covered with a gelatinous flesh beset with numerous polype-bearing tubercles. Fourteen species, chiefly inhabitants of the Indian and Mediterranean seas.

**ANTI PATHETICAL** a (from *antipathy*) Having a natural contrariety to any thing (*Howell*).

**ANTI PATHY** s (from *avri* and *παθος*, *antipathe*, Fr) A natural contrariety to any

thing, so as to shun it involuntarily opposed to sympathy (*Locke*)

**ANTIPATHY** is reckoned by many, a natural horror and detestation, an insuperable hatred, an involuntary aversion, which a sensitive being feels for some other object, whatever it is, though the person who feels this abhorrence is entirely ignorant of its cause, and can by no means account for it. Such is the invincible aversion of particular persons against cats, mice, spiders, &c., a prepossession which is sometimes so violent, as to make them faint at the sight of these animals. Of the most common and natural antipathies the ancient naturalists, the schoolmen, and the vulgar, form so many legends, and relate them as certain facts.

**M C G Lehmann** in his observations on the manner in which the spider spins its web, speaking of this antipathy says 'It is of importance to consider by what means that aversion commonly called natural, and which is merely the result of improper education, can be overcome. Rosel accustomed himself to view these insects first at a distance. He then considered their webs, and at last looked at the insects themselves through a microscope. Goze first viewed individual parts of spiders, such as the legs, head, &c. till he was at length able to look without any sentiment of aversion at the entire insect. Both these naturalists, by long habit, so far overcame this aversion, that they could handle and examine spiders with the same indifference as others can flies.'

**ANTIPELAGIA**, an ancient law, which obliged children to furnish necessaries for their aged parents. In some Latin writers, this is rendered, very appositely, *lex ciconaria*, or the *stork's law*.

**ANTIPERISTALTIC**, in anatomy, a motion of the intestines contrary to the peristaltic motion. The word is derived from *anti*, against, *peri*, about, and *salutem*, that which hath the power of compressing.

**ANFIPERISTASIS** ( *anti* and *peristasis* ) The opposition of a contrary quality by which the quality it opposes becomes heightened or intensified (*Cowley*).

**ANIPESILENTIAL** ( *anti* and *pesilentia* ) Efficacious against the plague (*Har*).

**ANTIPHERNA**, a Greek term, whose meaning nearly corresponds with that of *jointure*.

**ANTIPILOGISTIC**, ( *anti* and *phlogiston*, from *anti*, against, and *phlegma*, to burn or inflame ), in medicine, a term applied to those medicines, plans of diet, and other circumstances, which tend to oppose inflammation, or which, in other words, weaken the system by diminishing the activity of the vital power.

**ANTIPILOGISTIC THEORY**, in chemistry, the theory which accounts for the phenomena of chemistry without the assistance of phlogiston. It is so called in opposition to the theory of Stahl, which explained every thing by means of phlogiston, and is therefore called the *phlogistic theory*. See the word

According to the theory last mentioned,

**phlogiston**, or the principle of inflammability, was considered as necessarily belonging to all combustible bodies, and the separation of it as the cause of their combustion. The eminent talents of the founder of this theory, the number of valuable facts which he discovered, and the ingenuity of his experiments, contributed to obtain for it a very universal reception among chemists, by whom it was long and exclusively regarded with admiration and applause. During all this time, however, nobody could tell what phlogiston was—and no proof of its existence was afforded, except the impossibility of explaining the burning of bodies without it. The doctrine was even found to involve this absurdity,—that in the combustion, or as it was called the calcination, of metals those substances became heavier by the loss of their phlogiston, and as this was observable also in the combustion of sulphur which yielded an acid of greater weight than the quantity of sulphur consumed—the followers of Stahl who reined upon his theory and adhered to their opinions with obstinacy, were reduced to the necessity of assigning to their favourite phlogiston a principle of levity, imagining that being lighter than nothing, its separation from another body would leave that body heavier than before. But this subterfuge would by no means clear the difficulty, nor remove suspicion from the theory it was urged to support. Accordingly philosophers became dissatisfied with it, and, after many alterations, modifications, and improvements, it was finally abandoned in favour of the opposite theory, which explains combustion and various other phenomena of chemistry, by the absorption of oxygen, (instead of the loss of phlogiston,) and ascribes to the addition of this principle the increase of weight which metals, and various other bodies, acquire by combustion. The author of this theory was the illustrious, but unfortunate, Lavoisier, who, availing himself of many preceding discoveries of others, adding to them the results of his own accurate and brilliant experiments, and combining the whole in his vigorous and discriminating mind, has rendered to chemistry a most essential service, and acquired for his own name a celebrity which will last as long as the science to which his labours, his fortune, and his talents were dedicated. For some years he stood alone in defence of his opinions, but he was afterwards joined by Berthollet, Fourcroy, and Morveau, in France, then by Kirwan, and others in England; and by most of the chemists on the continent. His theory, which is frequently distinguished by his name, is now adopted, at least in the most prominent parts of it, by almost all the philosophers and chemists in the world, Dr Priestley being the last person of any note who persisted in his opposition to it.

As it would be improper to state further particulars on this subject here, we are under the necessity of referring to the articles **CHEMISTRY**, **COMBUSTION**, **LAVOISIER**, **OXYGEN**, **PHLOGISTON**, and **WATER**.

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**ANTIPHONARY**, antiphonarium, a service book which contained all the invitatories, responses, collects, and whatever else was sung or said in the choir, except the lessons. This is otherwise called responsarium, from the responses therein contained. The author of the Roman antiphony was pope Gregory the Great.

**ANTIPHONY**, a term in music, used by the ancient Greeks, in opposition to Homophony, which implied a performance wholly in unison. Antiphony also signified certain symphonies performed by various voices, or instruments, in octaves and fifteenths to each other, but was more particularly applied to the practice of singing anthems and hymns alternately or in dialogue. The present signification of the word antiphony only applies to certain short passages occasionally drawn from scripture, and allusive to the particular feast or celebration of the day.

**ANTIPIRASIS**, a sort of figurative expression, which has a contrary meaning to what it carries in appearance. Or, a kind of irony, wherein we say one thing, and mean the contrary. The word is derived from *anti*, and *piras* of *πῶς* *I speak*. Sanctius defines antiphrasis to be a form of irony whereby we say a thing, by denying what we ought rather to affirm it to be. As when we say, it did not displease me, or he is no fool, meaning, I was pleased with it, or, he is a man of sense. —On this principle, the antiphrasis ought to be ranked among the figures of sentences, and not among the *trope* of words.

**ANTIPODES** *a* (from *antipodes*) Relating to the antipodes (*Brown*).

**ANTIPODES** in geography, are the inhabitants of two places on the earth which lie diametrically opposite to each other, or that will feet to feet — that is, if a line be continued down from our feet quite through the centre of the earth till it arrive at the surface on the other side it will fall on the feet of our Antipodes — and vice versa — Antipodes are 180 degrees distant from each other every way on the surface of the globe, they have equal latitudes, the one north and the other south, but they differ by 180 degrees of longitude they have therefore the same climates or nearly the same degrees of heat and cold, with the same seasons and length of days and nights, but all of these at contrary times — it being day to the one when it is night to the other, summer to the one when it is winter to the other &c.

**ANTIPOPE** *s* (from *anti* and *pope*) He that usurps the popedom (*Addison*).

**ANTI-PORTICO**, in architecture, a vestibule.

**ANTI-PROBABILISM**, the doctrine or system of those who hold it unlawful to follow the less probable opinion, in opposition to the more probable one.

**ANTI-PROBOLE**, in rhetoric, a figure whereby the defendant adopts or admits the charge brought against him by the prosecutor. For *gr* Supposing the prosecutor *s* *πρὸς* to be, Titus has killed Caius, the defendant *s* anti-

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probole may be, I have killed him, but ~~was~~ designedly.

**ANTI-PROEMPTICON**, in poetry, a poem wherein a person going a journey addresses himself to his friends.

**ANTIPTOSIS** *s* (*αντίπρωσις*) A figure in grammar, by which one case is put for another.

**ANTIQUARE**, among Roman lawyers, properly denotes the rejecting of a new law, or refusing to pass it, in which sense antiquating differs from abrogating.

**ANTIQUARE** is also used for a law's growing obsolete, or into disuse, either by age or non observance.

**ANTIQUARI**, a name given to copiers of old books. After the decline of learning amongst the Romans, and when many religious houses were erected, learning was chiefly in the hands of the clergy, the greatest number of whom were regulars, and lived in monasteries. In these houses were many industrious men who were continually employed in making new copies of old books, either for the use of the monastery, or for their own emolument. These writing monks were distinguished by the name of Antiquarii.

**ANTIQUARIUM**, in antiquity an apartment in which their antique monuments were preserved.

**ANTIQUARY**, a person who studies and searches after monuments and remains of antiquity, as old medals, books, statues, and inscriptions, and, in general, all curious pieces that may afford any view into antiquity. In the chief cities of Greece and Italy, there were persons of distinction called antiquaries, whose business it was to show strangers the antiquities of the place, and explain the ancient inscriptions. Paulani calls these antiquaries *Εἰρηνοί*. The Sicilians call them *mystagogi*. There was an ancient college of antiquaries erected in Ireland by Ollam Fodhla, 700 years before Christ, for composing a history of that country, and to this it is owing, that the history and antiquities of that kingdom may be traced back beyond those of most other nations. There is a society of antiquaries in London, and another in Edinburgh, incorporated by the king's charter.

**ANTIQUARY** is also used by ancient writers for the keeper of the antiquarium, or cabinet of antiquities. This officer is otherwise called *archæota*, or antiquary of a king, a prince, a state, or the like.

**ANTIQUARY** *a* Old antique (*Shaks*)  
*To* ANTIQUATE *n* *a* (*antiquo*, Lat.)  
*To* put out of use to make obsolete (*Addison*).

**ANTIQUATEDNESS** *s* (from *antiquated*) The state of being antiquated.

**ANTIQUÉ** *a* (*antique*, French) 1 Ancient, old, not modern (*Shakspeare*) 2 Of genuine antiquity (*Prior*) 3 Of old fashion (*Smith*) 4 Odd, wild, antick (*Donne*)

**ANTIQUÉ** *s* (from the *adj*) An antiquity, a remnant of ancient times (*Sneyt*).

**ANTIQUÉ**, is a term frequently used by sculptors, painters, and architects, to denote

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such pieces of their different arts as were made by the ancient Greeks and Romans

**ANTIQUENESS** : (from *antique*) The quality of being antique (*Addison*)

**ANTIQUITIES**, a term implying all testimonies, or authentic accounts that have come down to us of ancient nations. Bacon calls antiquities the wricks of history, or such particulars as industrious and learned persons have collected from genealogies, inscriptions, monuments, coins, etymologies, archives, instruments, &c. Antiquities include "an historical knowledge of the edifices, magistrates, office, habiliments, manners, ceremonies, worship, and other objects worthy of curiosity, of all the principal ancient nations of the earth. This science is not a matter of mere curiosity, but is indispensable to many, is, the theologian, who ought to be thoroughly acquainted with the antiquities of the Jews, to enable him properly to explain numberless passages in the Old and New Testaments to the lawyer, who, without the knowledge of the antiquities of Greece and Rome, can never well understand and properly apply the greatest part of the Roman laws to the physician and the philosopher, that they may have a complete knowledge of the history and principles of the physics and philosophy of the ancients to the critic that he may be able to understand and interpret ancient authors to the orator and poet who will be thereby enabled to ornament their writings with numberless images, allusions, comparisons, &c.

Antiquities are divided into sacred and profane, into public and private universal and particular &c. It is true, that the antiquaries (especially such as are infected with a spirit of pedantry, and the number of these is great) frequently carry their inquiries too far and employ themselves in laborious researches after trifles, but the abuse of a science ought never to make us neglect the applying it to rational and useful purposes. Many antiquaries also restrain their learned labours to the elucidissement of the antiquities of Greece and Rome, but this field is far too confined, and by no means contains the whole of this science, seeing it properly includes the antiquities of the Jew, Egyptians, Persians, Phœnicians, Carthaginians, Germans, and in general all those principal nations mentioned in ancient history, so far as any accounts of them are come down to us.

If to the general subjects above mentioned we add the particular study of antiques, of the statues, bas-reliefs, and the precious relics of architecture, painting, medals, &c. it is easy to conceive that antiquities form a science very extensive and complicated, and highly deserving the attention of almost all literary men. In this place, however, we can do little else than point out to the reader the principal sources of information to which he may apply.

A sufficient knowledge of the general antiquities of the Hebrews may be obtained from the Bible, Philo and Josephus, and the Talmud; and, among the writers of more modern

date, Arias Montanus, Carpsovius, Maimonides, Buxtorf, Reland, Leusden, Calmet, Witsius, Bucher, Benzelius, Bynæge, Hottinger, and Michaelis, may be deemed the best. Among the English, Selden, Godwyn and Lewis. Crompton's Dictionary of the Bible also contains many references for the curious reader, and those who would know how far their ancient and modern practices agree, may consult Levi's Jewish Ceremonies.

On the civil history of the Jews Josephus may be consulted, with Struckford and Pridcaux's Connections. On the life and death of Moses, however, on the Exodu of the Israelites, and their leader on the Jewish kings, the Babylonish captivity, and on the history and condition of the Jews in different countries subsequent to their dispersion the writers are extremely numerous and a complete catalogue of them may be found in Menckel's Bibliotheca Historica. On the destruction of Jerusalem, Josephus and Pictus are the principal writers in repute. And for the history of the Jews in England, Love's work may be referred to.

But the most copious work on Jewish antiquities is Ugolini's *Thesaurus* in thirty-four volumes folio, the first bearing the date of 1744, the last 1769 containing all the best works which previously to that time had appeared, on the manners, laws, rites and institutions of the Hebrews amounting in number to no less than four hundred and eighty eight distinct treatises.

The most curious collection of Hebrew manuscripts in this country which illustrate the literary antiquities of the Jews may be found in the Bodleian Library at Oxford. Few of them in point of age run beyond eight hundred years, and the most ancient we believe, were brought by Dr Pococke from Constantinople.

To recite even the titles of the different works in which the antiquities of Egypt have been treated, would be endless. Among the ancient writers Herodotus Pausanias Strabo, Diodorus Siculus, and Plutarch are the principal. Herodotus, Thales, and Pythagoras, it will be remembered, were initiated among the Egyptian priests. The best work on the mythology of Egypt is Jablonski's *Pantheon Egyptiacum*. On its present remains, Pococke Norden, Niebuhr, Sonnini, and Denon may be consulted. Graves and Norden have expressly written on the pyramids. Kitcher on the mummies and all that is material on the subject of the obelisks, may be found in Zocchi's *De Obeliscorum Usu*. In the authentic narrative of Dr Wittman, modern readers will find some facts worthy of their attention, relative to the monumental remains still existing in Egypt.

On the subject of the antiquities of India, we refer to Halhed's *Code of Gentoo Laws*, and the papers of sir William Jones and others in the *Asiatic Researches*.

Gronovius has given a collection of the chief writers on the antiquities of Greece, to which we shall refer the reader once for all,

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and Rouse, Pfeiffer, Bos, and bishop Potter, have given shorter systems, the last of which is certainly esteemed the best, and which no scholar's library should be without. In what relates to the religion, the gods, vows, and temples of Greece, it has been deemed too summary, but in the military affairs and miscellaneous customs it remained till lately without a rival. A work which surpasses it, and perhaps all others in the English language, for accuracy and completeness, has just made its appearance from the pen of Mr Robinson of Rivingtonale.

On the gods, temples, oracles, and priests of Greece, the writers are extremely numerous: on the public well and magistracy of Greece, Stephanius, Laurentius, and Van Dale, of modern writers, have perhaps the greatest share of credit: on the court of Arcopagus, Meursius, and Fischer, on the laws and punishments of Greece, Priau, Meursius, and Petit, on military concerns, Arrius, Polyænus, and Zlirin, on the gymnastic art, and exercises of the Greeks, Hieronymus Mercurialis, Joubert, Faber, and Barthelemy, on the theatres and scenic exhibitions, Donatus, Seiliger, Brindin, and the abbé Bartholæmy, on their entertainments, luxury, and baths, Conutus, Meussonius, Gedoyu, Du Choul, Ferrarius, and Kuhn, on their marriages and institution of their children: besides the general writers, Hauptmann, Junius, Stisser, and Zuberh, are the more particular: and on their funerals, Nicolai, Laetius, and Eckhard.

A body of the authors on the Roman antiquities was published by Grævius in the *Theatrum*, and Dine and Pitiscus published lexicons of them. For the most part however they are too voluminous, not only to be generally useful, but even to refer the studious reader to except on single points. On this account a number of abridgements have been published, of which, till of very late years, those of Kennet and Nicuport were esteemed the best. The latter was written in Latin, but it abounded in difficult phrases, and was deficient in one or two material parts, which were supplied by Kennet. Both, however, have been since superseded by the work of Dr Adams, which, of all the abridgements, is the best adapted to illustrate the classics. It is sufficient to say that he has borrowed with freedom from all hands whatever he judged fit for his purpose, and the enumeration of his sources will prove the best aid to an enquiring reader. He was chiefly indebted to Minutius, Brissonius, and Middleton, on the senate, to Pignorius on slaves, to Sigonius and Græchius, Manutius, Huber, Gravina, Merula, and Heineccius, on the assemblies of the people, the rights of citizens, the laws and judicial proceedings, to Lipsius on the magistrates, the art of war, shows of the circus, and gladiators, to Sheffer on nival affairs and carriages, to Ferrarius on the Roman dress, to Kirkmannus on funerals, to Arbuthnot on coins, to Dickson on agriculture, to Donatus on the city, to Turnebius, Abrahamus, Rossinus, Salguesius, Hottoma-

nus, Grævius and Gronovius, Montfaucon, Pitiscus Ernæsti, and particularly Gesner, in different parts of the work.

On the antiquities of ancient Rome, the works of Publius Victor, Fulvius, Fabricius, Onuphrius Panvinus, Boissard, and Adler, are perhaps the best on its ancient edifies, the work of Desgodetz, in which the views are given from actual measurement, *Venue's Descrizione Topografica delle Antichità di Roma*, and D'Ovrebek's *Restes de l'Ancienne Rome*, public ways, its walls, aqueducts, and bridges, Bergier, Gautier, and D'Anville may be referred to: while the statues and other works of art with which Rome and her provinces abounded have frequently furnished subjects for separate disquisitions.

A correct view of the antiquities of Britain from the earliest period to the end of Henry the Eighth's reign, may perhaps be best collected from Dr Henry's history. The writers he refers to will present the reader with all the most authentic sources of enquiry.

Of what relates to the early Britons, however, much that has been written is too nearly connected with the fabulous, and instead of seeking for information on Druidical history, where it was most likely to be obtained correctly, the generality of our writers have been too apt to busy themselves with theory and etymology. "Druidism," says one, "was palpably Phœnician." The Druidical system was taught the Gauls by Phythagoras! The opinion however, which in Cæsar's time was generally entertained in Gaul, has been overlooked. Cæsar evidently took considerable pains to learn every particular relating to the Druids, and he states it to have been the received opinion that Druidism originated in Britain. And in corroboration of this idea, it has been both strongly and correctly urged, that there is not a single authority for the existence of Druidism any where but in Celtic Gaul and part of England. Cæsar, however, did not himself witness its existence in Britain. Tacitus is the first, and, we believe, the only author who notices it, for the Romans did not meet with it till they had advanced far into Wales. Cæsar, Dio Cassius, and Tacitus, are the principal authorities in regard to British history. On the religious system, and the mysteries of Druidism, the writers are more numerous, but Cæsar, Diodorus Siculus, Ælian, Strabo, Tacitus and Pliny, are perhaps the most valuable of the antients. Cluverius's *Germania Antiqua*, and the works of Pezron and Pelloutier upon the Celts, are however more recent authorities.

Of the structures which the Britons erected the remains are few. Abury and Stonehenge may be deemed the principal. On the vast tracts of solitary down with which our island abounds, relics of a smaller kind are continually discovered. Rowbright in Oxfordshire affords the best, perhaps, and they are very numerous in Anglesey. On these Stukeley and Rowland are perhaps the best authorities for the history of the Britons under the Roman

government, we refer to Horsa's Britannia Romana Antonine's Itinerary preserves the names of the towns and stations on the Roman military ways, with the number of miles between each town.

On the antiquities of our Saxon ancestors there is more to say, and we can trace their history with tolerable certainty. The devastations of the Danes, however, proved a great destruction to their monuments, and though the Normans were the descendants of the same ancestors, they were not less injurious to the institutions of the people who had gone before them. The best of their remains of art were evidently fabricated upon Roman models. Their architecture exhibited, as its leading feature, a bold imitation of the Roman arch, and their coins had Latin inscriptions. The little science they possessed during the middle and latter periods of their existence, though originally perhaps obtained from abroad, was cultivated with uncommon zeal and Alcuin, Bede, and Alfred, are names in the history of their literature that will never be forgotten. The illuminations of the Saxon manuscripts are the best records of their manners in the different centuries, and the most curious information relating to them will be found in the elaborate works of Mr Strutt and Mr Turner. In this branch of our antiquities the field of investigation is still open. They have never yet been viewed upon that enlarged scale on which they deserve to be considered. The best collection of Saxon coins is that which is now deposited in the British Museum. Their remains of art are numerous, but for the most part undecided the Normans having imitated their exertions with little other difference than in occasional enlargement of the scale. Of Saxon manuscripts, the best collection will be found in the library of the British Museum, and in the Bodleian Library at Oxford. Mr King has treated their military antiquities in his History of Castles, and Dr Hickes's Thesaurus may be viewed as the grand repository of their general literature.

Of the English nation at nearer periods, our documents, as may be naturally expected, occur in still greater variety. There is scarcely a county history but sets our antient manners in new points of view. They have been often and systematically treated, and the names of Camden, Henry, Strutt, and Gough, are sufficient to be noticed. *Gregory's Dict*

**ANTIQUITY**, signifies times or ages past long ago. Thus, we say, the heroes of antiquity, &c.

**ANTIQUITY**, likewise expresses the great age of a thing, in this sense we speak of the antiquity of a family, of a kingdom, and the like.

**ANTIRRHINUM** (from *anti*, against, and *rhino*, the nose, so called because it represents the nose of a calf.) Snap dragon, toad-flax, or calf's-foot a genus of the class and order didynamia, angiosperma. Calyx five-parted, corol with a nectariferous prominence at its base pointing downwards, the orifice closed, and furnished with a cloven, convex palate.

**capsule two-celled** There are seventy species, which may be thus subdivided 1 Leaves angular, capsules many-valved 2 Leaves opposite, capsules many-valved 3 Leaves alternate, capsules many-valved 4 Corols without spur, capsules perforated with three pores 5 Leaves pinnatifid Every quarter of the globe gives birth to some of this numerous species. Those indigenous to our own country are, a cymbalaria, found on old walls, ivy-lined toad grass 1 spurious, in corn fields round-leaved-flucilin a repens, on chalk-hills, creeping toad flax a minus, in corn-fields, small toad-flax a limosa, in hedges, common yellow toad-flax a majus, on old walls, the greater snap dragon a orontium, in corn-fields, small snap dragon 1 arvense, in corn-fields, cornblue toad-flax.

**ANTIRRHINUM LINARIA** The systematic name for the linaria of the pharmacopœia. See LINARIA.

**ANTISABBATARIANS** a modern religious sect, who oppose the observance of the Christian sabbath. The great principle of the Antisabbatarians is that the Jewish sabbath was only of ceremonial not moral obligation, and consequently is abolished by the coming of Christ.

**ANTISAGOGI**, in rhetoric, a figure differing little from that called concession. The following passage from Cicero is an instance of it. *Difficilis ratio belli gerendi, at plena fiducia plena pietatis et si dicas, magnus labor, multi periculi proponuntur, at gloria ex his immortalis est consecutura.* See CONCESSION.

**ANTISCIAN'S**, or **ANTISCII**, in geography are people who dwell in the opposite hemispheres of the earth, as to north and south, and whose shadows at noon fall in contrary directions. This term is more general than *antipodii*, with which it is often confounded. The Antiscians stand contradistinguished from Periscians.

**ANTISCII** is also used sometimes, among astrologers, for two points of the heavens equally distant from the tropics.

**ANTISCORBUTICS**, (*antiscorbutica*, sc *medicamenta*, from *anti*, against, and *scorbutus*, the scurvy) Those medicines which cure the scurvy. To this class belong oxygen gas, acids, vegetables bark, &c.

**ANTI-SEPTICS** (*antiseptica*, sc *medicamenta*, *antiseptica*, from *anti*, against, and *sepsis*, to putrefy) Those medicines which possess a power of preventing animal substances from passing into a state of putrefaction, and of obviating putrefaction when already begun. This class of medicine comprehends four orders 1 Tonic antiseptics, as cinchona, angustura cortex, chamæmelum, &c which are suited for every condition of body, and are, in general, preferable to other antiseptics, for those with relaxed habits 2 Refrigerating antiseptics, as acids, which are principally adapted for the young, vigorous, and plethoric 3 Stimulating antiseptics, as wine and alcohol, best adapted for the old and debilitated 4 Antispasmodic antiseptics, as camphora and assa-



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*fætida*, which are to be selected for irritable and hysterical habits

**ANISPASIS** *s* (*ἀνισπασμός*) The revulsion of any humour into another part

**ANISPASMODICK** *a* (*ἀνισπασμικός*) That has the power of relieving the cramp

**ANTISPASMODICS**, (*antispasmodica*, *sc medicamenta, ἀνισπασμωδικά*, from *ἀντι*, against, and *σπασμός*, a spasm) Those medicines which possess the power of allaying inordinate motions in the system, particularly those involuntary contractions which take place in muscles, naturally subject to the command of the will. The medicines referable to this class are divided into two orders. 1 Stimulating antispasmodics, as alkali volatile, olea essentialia, liquor æthereus, which are to be given to the melancholic and those with torpid habits. 2 Sedative antispasmodics, as camphora, moschus, and opium, which are preferred to the former for singular and irritable habits

**ANISPIPLENICK** *a* (*ἀντιπληνικός*) Efficacious in diseases of the spleen (*Floyer*)

**ANTISIASIS**, in oratory, a defence of an action from the consideration that had it been omitted worse would have ensued. This is called by Latin writers *comparativum argumentum*, such e. g. would be the gentilis defence who had made in inglorious capitulation, that, without it, the whole army must have perished.

**ANTISTASIS**, the gibbous part of the liver in the Grecian victims

**ANTIISTHENES**, a philosopher who taught rhetoric, and had among his pupils the famous Diogenes, but when he had heard Socrates, he shut up his school, and told his pupils, "Go seek for yourselves a master, I have now found one." He was the head of the sect of the Cynic philosophers. One of his pupils asked him, what philosophy had taught him? "To live with myself," said he. He sold his all, and preserved only a very ragged coat, which drew the attention of Socrates, and tempted him to say to the Cynic, who carried his contempt of dress too far, "Antisthenes, I see thy unity through the holes of thy coat." Antisthenes taught the unity of God, but he recommended suicide. Some of his letters are extant. He flourished 396 years B. C.

**ANTISTOFCHON**, in grammar, the using one letter instead of another, as *o*lli for *illi*.

**ANTISTROPHE**, that part of a dance, practised by the ancients, in which they turned towards the left, or from west to east, in surrounding the altars.

**ANTISTROPHE**, in lyric poetry, an echo or rephection to the strophe, anciently sung while the performers danced from east to west.

**ANTISTROPHE**, in grammar, a figure by which two things mutually depending on one another, are reciprocally converted, as, the servant of the master, the master of the servant.

**ANTISTROPHE**, in rhetoric. See **EPISTROPHE**.

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**ANTISTRUMATICK** *a* (*ἀντι* and *στρώμα*) Good against the king's evil (*Wise-man*)

**ANTITACTÆ**, in church history, a branch of Gnostics, who held, that God was good and just, but that a creature had created evil, and consequently that it is our duty to oppose this author of evil, in order to avenge God of his adversary.

**ANTITHENAR**, (*antithenar*, *ἀντιθένας*, from *ἀντι*, against, and *θένα*, the palm of the hand) A muscle of the foot. See **ADDUCTOR POLLICIS PEDIS**.

**ANTIITHLSIS**, in rhetoric, a contrast or opposition of words or sentiments. Such is that of Cicero, in the second *Catilinarian*. "On one side stands modesty, on the other impudence, on one fidelity, on the other deceit, here piety, there sacrilege, here continency, there lust, &c." Such also is that of Augustus to some seditious young men. *Audite, juvenes, senem, quem juvenem senes audivere.* The following is a fine example of modern antithesis: the author in speaking of the unparalleled animosity which inflamed the first war with the French republic, proceeds thus: "Never before were so many opposing interests, passions, and principles committed to such a decision. On one side an attachment to the ancient order of things, on the other a passionate desire of change, a wish in some to perpetuate, in others to destroy every thing every abuse sacred in the eyes of the former, every foundation attempted to be demolished by the latter, a jealousy of power shrinking from the slightest innovation, pretensions to freedom pushed to madness and anarchy, superstition in all its dotage, impiety in all its fury, whatever, in short, could be found most discordant in the principles, or violent in the passions of men, were the fearful ingredients which the hand of divine justice selected to mingle in this furnace of wrath." Hall's Thanksgiving Sermon.

**ANTITHESIS** is sometimes used for controversy. In this sense we meet with antithetic method, antithetic discourses, &c.

**ANTITRAGICUS**, (*antitragicus*, *sc musculus*) One of the proper muscles of the ear, whose use it is, to turn up the tip of the antitragus a little outwards, and to depress the extremity of the antihelix towards it.

**ANTITRAGUS**, (*antitragus*, from *ἀντι*, and *τραγός*, the tragus) An eminence of the outer ear, opposite to the tragus.

**ANTITRINITARIANS**, those who deny the Trinity, and teach that there are not three persons in the Godhead. Thus the *Samosatenians*, who do not believe the distinction of persons in God, the *Arians*, who deny the divinity of the Word, and the *Macedonians*, who deny that of the Holy Spirit, are all properly Antitrinitarians. Among the moderns, Antitrinitarians are particularly understood of Socinians.

**ANTITYPE**, properly signifies a type or figure corresponding to some other type. This word occurs twice in the New Testament,

viz in the Epistle to the Hebrews, ix 24 and in St Peter, 1 Eph iii 21 where its genuine import has been much converted

**ANTITYPE**, among the ancient Greek fathers, and in the Greek liturgy, is also applied to the symbols of bread and wine in the sacrament

**ANTITYPICAL** *a* (from *antitype*) That relates to the intitype, that explains the type

**ANTIVENEREAL** *a* (*anti* and *venereal*) Good against the venereal disease (*Wise man*)

**ANTI/UMICS**, (from *anti* and *ζη*, fermentation) Medicines which resist fermentation in the system

**ANTILR** (*andoullier*, Fr) Branch of a stag's horns (*Prior*)

**ANTIOFCI** (from *anti* and *αιων*) Those inhabitants of the earth who live under the same meridian at the same distance from the equator, the one toward the north, and the other to the south The antioeci have the same hours of day and night, but opposite seasons

**ANTOMOSIA**, (from *anti*, and *μοσ*, *I swear*), in ancient writers in oath taken by both the parties in a criminal accusation, whereby the accuser charges the other with the fact, and the accused in his turn denies the same

**ANTONIA** The name of some eminent Roman ladies, the most remarkable of whom was the wife of Drusus, the son of Livia, and brother of Tiberius She became mother of three children, Germanicus, Caligula's father, Claudius the emperor, and the debauched Livia Her husband died very early, and she never would marry again, but spent her time in the education of her children Some people suppose her grandson Caligula ordered her to be poisoned, A D 38

**ANTONINUS**, surnamed Pius, was adopted by the emperor Adrian, to whom he succeeded This prince is remarkable for all the virtues that can form a perfect statesman, philosopher, and king In cases of famine or inundation, he relieved the distressed, and supplied their wants with his own money In his behaviour to his subjects, he behaved with affability and humanity, and listened with patience to every complaint brought before him When told of conquering heroes, he said with Scipio, I prefer the life and preservation of a citizen, to the death of 100 enemies He did not persecute the christians like his predecessors, but his life was a scene of universal benevolence His last moments were easy, though preceded by a lingering illness He extended the boundaries of the Roman province in Britain, by raising a rampart between the friths of Clyde and Forth, but he waged no wars during his reign, and only repulsed the enemies of the empire who appeared in the field He died in the 75th year of his age, after a reign of 23 years, A D 161, and was succeeded by his adopted son M Aurelius Antoninus, surnamed the Philosopher, a prince as virtuous as his father, and

whose book of Meditations is universally known and admired

**ANTONINUS WALL**, the name of the third rampart or defence that had been built or repaired by the Romans against the incursions of the North Britons It is called by the people in the neighbourhood, Graham's Dyke, from the notion that one Graham or Grinnus first made a breach in it after the retreat of the Romans out of Britain The first barrier erected by the Romans was the chain of forts made by Agricola from the frith of Forth to that of Clyde, in the year 81, to protect his conquests from the incursions of the Caledonians The second was the vallum, or dyke, flung up by Adrian in the year 121 It terminated on the western side of the kingdom, at Axlodunum or Brugh, on the Solway sands, and was supposed to have reached no further than Pons Aili, or Newcassle, on the eastern But from an inscription lately discovered, it appears to have extended as far as the wall of Severus This rampart of Adrian's was united much further south than Agricola chain the country to the north having been either, according to some authors, recovered by the native Britons after the departure of Agricola or, according to others, voluntarily slighted by Adrian However, this work of Adrian's did not long continue to be the extreme boundary of the Roman territories to the north in Britain For Antoninus Pius the adopted son and immediate successor of Adrian having, by his lieutenant Lollius Urbicus recovered the country once conquered by Agricola, commanded another rampart to be erected between the frith of Forth and Clyde, in the tract where Agricola had formerly built his chain of fort The great number of inscriptions which have been found in or near the ruins of this wall, or in part, to the honour of Antoninus Pius leave us no room to doubt its having been built by his direction and command If the fragment of a Roman pillar with an inscription, now in the college library of Edinburgh, belonged to this work, as it is generally supposed to have done, it fixes the date of its execution to the third consulship of Antoninus, which was A D 140, only twenty years after that of Adrian of which this seems to have been imitator This wall or rampart, as some imagine reached from Caer riden on the frith of Forth, to Old Kirkpatrick on the Clyde, or, as others think, from Kinnel on the east, to Dunglass on the west These different suppositions hardly make a mile of difference in the length of this work, which, from several actual mensurations, appear to have been thirty-seven English or forty Roman miles Capitolinus, in his life of Antoninus Pius, directly affirms, that the wall which that emperor built in Britain was of turf This in the main is unquestionably true, though it is evident from the vestiges of it still remaining, which not very many years ago were dug up and examined for near a mile together that the foundation was of stone Mr Camden also tells us, from the papers of one

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Mr Anthony Pont, that the principal rampart was faced with square stone, to prevent the earth from falling into the ditch. The chief parts of this work were as follows. 1 A broad and deep ditch, whose dimensions cannot now be discovered with certainty and exactness, though Mr Pont says it was twelve feet wide. 2 The principal wall or rampart was about twelve feet thick at the foundation, but its original height cannot now be determined. This wall was situated on the south brink of the ditch. 3 A military way on the south side of the principal wall, well paved, and raised a little above the level of the ground. This work, as well as that of Adrian, was defended by garisons placed in forts and stations along the line of it. The number of these forts or stations, whose vestiges were visible in Mr Pont's time, were eighteen, situated at about the distance of two miles from each other. In the intervals between the forts there were turrets or watch towers. But the number of these, and their distance from each other, cannot now be discovered.

It is not a little surprising, that though it is now more than 1600 years since this work was finished, and more than 1300 since it was slighted, we can yet discover from authentic monuments, which are still remaining, by what particular bodies of Roman troops almost every part of it was executed. This discovery is made from inscriptions upon stones, which were originally built into the face of the wall, and have been found in or near its ruins, and are carefully preserved. The number of tones with inscriptions of this kind now extant is eleven, of which six may be seen at one view in the college of Glenow, or in the college of Aberdeen, one in the college of Edinburgh, one in the collection of baron Clerk, one at Cochran's house, and one at Calder house. From the inscriptions it appears in general, that this great work was executed by the second legion, the vexillations of the sixth legion and of the twentieth legion, and one cohort of auxiliaries. If these corps were all complete, they would make in all a body of 7500 men. Some of these inscriptions have suffered greatly by the injuries of time and other accidents, so that we cannot discover from them with absolute certainty, how many pieces of this work were executed by each of these bodies of troops. The sum of the certain and probable information contained in these inscriptions, as it is collected by the learned and illustrious Mr Horsley, stands thus

	Paces
The second legion built	11,603
The vexillation of the sixth legion	7,411
The vexillation of the twentieth legion	7,801
All certain	26,815
The vexillation of the twentieth legion, the monument certain, and the number probable	3,411
The same vexillation, on a plain monument, no number visible, supposed	3,500

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The sixth legion, a monument, but no number, supposed 3,000  
Cohort prima Cugernorum 3,000

Total 39,726

or 39 miles 726 paces, nearly the whole length of the wall. It would have been both useful and agreeable to have known how long time these troops were employed in the execution of this great work. But of this we have no information. Neither do we know what particular bodies of troops were in garrison in the several forts and stations along the line of this wall, because the garisons were withdrawn before the Nottin Imperii was written.

ANTONIO, (St.) one of the Cape de Verd islands, on the African coast. It is full of high mountains. Lat 17° 0' N. Lon 23° 0' W.

MANTIONIS, a name common to many illustrious Romans, the most conspicuous of whom was Marcus, the universal grandson to the orator M. Antonius, and son of Antonius, surnamed Cretensis. He was a great and tribune of the people, in which he distinguished himself by his ambitious views. He always entertained a secret resentment against Cicero, for having put to death Corn. Lentulus, who was concerned in Calpurnius's conspiracy. When the civil war was torn by the factions of Pompey and Cæsar's adherent, Anthony privately retired from Rome to the camp of Cæsar, advised him to march his army to Rome, took the command of the left wing at Pharsalia, and according to a preconcerted scheme, offered him a truce in the presence of the Roman people. When Cæsar was assassinated Anthony pronounced in oration over his body. He besieged Mutina, which had been allotted to D. Brutus for which the senate judged him an enemy to the republic, at the remonstrance of Cicero. He was conquered by the consuls Hortius and Pansa, and by young Cæsar, who soon after joined his interest with that of Antony, and formed the triumvirate celebrated for its cruel proscriptions. The triumvirate divided the Roman empire among themselves. He then assisted Augustus at the battle of Philippi against the murderers of J. Cæsar, and he buried the body of M. Brutus, his enemy, in a most magnificent manner. During his residence in the East, he became enamoured of the fair Cleopatra queen of Egypt, and repudiated Octavia to marry her. This divorce incensed Augustus, who now prepared to deprive Antony of all his power. Antony assembled all the forces of the East, and with Cleopatra marched against Octavius Cæsar. These two enemies met at Actium, where a naval engagement soon began, and Cleopatra, by flying with 60 ships, drew Anthony from the battle and ruined his cause. After the battle of Actium, Antony followed Cleopatra into Egypt, where he found himself abandoned by all his allies, and saw the conqueror on his shores. He stabbed himself, and Cleopatra likewise killed herself with the bite of an asp. Antony died in the 56th year of his age, B. C. 30, and the conqueror shed tears

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when he was informed that his enemy was no more. He has been blamed for his great effeminacy, for his uncommon love of pleasures, and his fondness of drinking. In his public character he was courageous, but with the intrepidity of Caesar, he possessed all his voluptuous inclinations. His fondness for low company, and his debauchery, form the best parts of Cicero's Philippics. Plutarch has written an account of his life.

**ANIONOMASIA**, a form of speech, in which, for a proper name, is put the name of some dignity, office, profession, science, or trade, or when a proper name is put in the room of an appellative. Thus a king is called his majesty, a nobleman, his lordship. We say the philosopher instead of Aristotle, and the orator for Cicero. Thus a man is called by the name of his country, a German, an Italian, a grave man is called Cato, and a wise man a Solomon.

**ANTIANDRIANS**, a sect of rigid Lutherans, who oppose the doctrine of Osiander relating to justification. These are otherwise denominated Osiandromystes. The Antiandrians deny that man is made just, with that justice wherewith God himself is just, that is, they assert, that he is not made essentially, but only imputatively just.

**ANTRIM**, a county of the province of Ulster in Ireland, bounded by St. George's Channel on the East, by Londonderry on the West, by the Decadonian Ocean on the North, and by the county of Down on the South-East. It contains about 383,000 acres. Its soil is fruitful. The large inland lake in this county, called Loughnach, is remarkable for petrifying wood. On the coast of Antrim is a celebrated pile of rocks, which the country people fondly imagined to have been the work of giants, and for that reason it is called the Giant's Causeway.

**ANTRIM**, the capital of the above county. It is a corporation and a market town. Lat. 54° 43' N. Lon. 6° 6' W.

**ANTRUM HIGHMORIANUM** (*Centri of the snout*) Antrum Antrium (antrum) maxillaris pituitarius. A large cavity in the middle of each superior maxillary bone, between the eye and the roof of the mouth, lined by the mucous membrane of the nose, and first described by Hugenote.

**ANTS**, ACID OF SULPHURIC ACID.

**ANTWERP**, the capital of Brabant in the Austrian Netherlands. This was a place of great trade about 200 years ago, the greater part of which is removed to Amsterdam. It is built in the form of a crescent. The harbour is very handsome and commodious, the water being about 22 feet deep and 400 wide, so that large vessels may come up to the quay. The public buildings are beautiful and convenient, and the about 200 in number. The streets are large and regular, and the citadel is supposed to be one of the strongest in the Low Countries. Lat. 51° 13' N. Lon. 4° 21' E.

**ANTYX**, in antiquity, the circumference of a shield.

**ANUBIS**, an Egyptian deity, represented

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under the form of a man with the head of a dog, because when Osiris went in his expedition against Iudæa, Anubis accompanied him, and clothed himself in a sheep's skin. His worship was introduced from Egypt into Greece and Italy. He is supposed by some to be Mercury, because he is sometimes represented with caduceus or wand. Some make him son of Osiris, others, his brother.

**ANVILLE** (anville, Saxon) 1 The iron block on which the smith lays his metal to be forged (*Dryden*). 2 Any thing on which blows are laid (*Shakspeare*).

**ANVILLE** (John Baptiste Bourguignon d') geographer to the king of France, was born at Paris in 1697. He was a most industrious student, labouring it is said, fifteen hours a day for fifty years, to improve his favourite science. His maps are in the highest estimation, and his works are all valuable. They are as follow: 1 A Dissertation on the Extent of the ancient Jerusalem, 1747, 8vo. 2 Some Particulars of ancient Gaul, drawn from the Remains of the Romans, 1761, 4to. 3 On ancient and modern Egypt, with a Description of the Arabian Gulf, 1766, 4to. 4 An Abridgment of ancient Geography, 1768, 5 vols. 12mo. 5 A Treatise on ancient Maritime, ancient and modern, 1760, 8vo. 6 The Geography is formed in Europe after the Fall of the Roman Empire, 1771, 4to.

**ANUS** (*anus quasi canis* is coming the head of the bowels), or according to Quintilian from anus, a cure of my mind, this being the termination of the circular intestine, and the incients not being contented to double their consonants, veteres enim says he, non geminant ut cononantes. The fundament. Also the small opening of the third ventricle of the brain, which leads into the fourth.

**ANXIETY** (*anxietas*, Latin) 1 Trouble of mind about some future event, perplexity, solicitude (*Pillaton*). 2 Depression of spirits (*Isaiah*).

**ANXIOUS** *a* (*anxius*, Latin) 1 Disturbed about some uncertain event (*Pope*, Carthage full of inquietude (*Dryden*).

**ANXIOUSLY** *ad* (from *anxius*) Solicitously, anxiously, carefully (*South*).

**ANXIOTENSIS** *s* (from *anxius*) The quality of being anxious.

**ANY** *a* (*any*, Saxon) 1 Ever, however he be (*Pope*). 2 Whosoever, whatsoever (*Shakspeare*).

**AOIDES**, in mythology, one of the many appellations of the muses, so called from Aoida, poet or singer.

**AORASIA**, in antiquity, the invisibility of the gods. The word is Greek, *noan*, and derived from *a priv* and *noan* to see. The opinion of the ancients with regard to the appearance of the gods to men, was, that they never showed themselves face to face, but were known from their habitation. They were known assumed the form of Citharus to speak to the two Ajaxes, but they knew him not till he turned his back to leave them, and discovered the god by his majestic step as he went from

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them Venus appeared to *A* near in the character of a huntress—but her son knew her not till she departed from him; her divinity was then betrayed by her radiant hair, her flowing robe and her majestic pace.

**AORIST**, among grammarians, a tense peculiar to the Greek language, comprehending all the tenses, or rather expressing in action an undetermined manner, without any regard to past, present, or future.

**AORISTIA**, in the sceptic philosophy, denotes that state of the mind wherein we neither assert nor deny any thing positively, but only speak of things as seeming or appearing to us in such a manner.

**AORTA** (*aorta* *aorion*, from *aor*, *aor* and *epo* *to keep*, so called because the ancients supposed that only air was contained in it.) The great artery of the body which arises from the left ventricle of the heart, forms a curve in the chest and descends into the abdomen, and from which all the other arteries except the pulmonary arteries. See **ARTERY**.

**AORTICA** (from *aor*, *aor*, and *ti*, *to hold* or *keep*) The fibres of the lungs the receptacles of respirable air.

**AOSTA** a territory of Piedmont with the title of a duchy. The capital is of the same name, *u* *is* in *Lat* 45° 49' *N* *lon* 7° 32' *E*.

**APACE** *ad* *to* Quick, speedily, hastily.

**APACIS** In botany, a genus of the class and order didynamia, monogynia. Calyxes, petals four erect unequal, germ superior, simple. The only known species is in the tree of Japan.

**APADISTIA**, a state of ignorance or unskillfulness in what relates to learning and the sciences. Hence it denotes uneducated and illiterate people called *apadentes*. The term *apadente* was particularly used among the French in the time of Huic, when the nation of wit at Paris was divided into two factions, one called by way of reproach *apadente*, and the other *studite*.

**APAGOGI**, in logic. See **ABDUCTION**. *Apagoge*, in the Athenian law, the carrying venereal tales to the pretence of justice. If the accuser was unable to bring him to the magistrature it was usual to take the magistrate along with him to the house where the criminal lay concealed, or defended himself.

**ALAGOGE**, in mathematics, is sometimes used to denote a progress or passage from one proposition to another; when the first having been once demonstrated, is afterwards employed in the proving of others.

**APAGOGICAL DEMONSTRATION**, an indirect way of proof, by showing the absurdity of the contrary.

**APALACHION** See **ALLEGANY MOUNTAINS**.

**APAIAGF** (from *απαλλάσσω* *to change*) A change or crisis in a disease by which it is subdued.

**APALUS** In zoology, a genus of the class and order insecta, coleoptera. Antennas filiform, feelers equal, filiform, jaw horny, one-toothed, lip membranaceous, truncate,

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entire. Two species, *a* *bimaculatus*, black, shells testaceous with a black dot. Inhabits the sandy plains of Iungpe—a golden *relatus*. Rufous herd, and two spots on the shells black. Inhabits North America.

**APAMLA**, or **APAMIA**, in ancient geography, a town of Syria, situated in a marshy country at the confluence of Orontes and Mar-syas, which form a kind of lake, that has no communication with the land but by a small isthmus. It is about 60 miles almost south of Antioch, and about 90 from Aleppo, in *N* *lat* 35° 6' *E* *lon* 37° 18'. Its former name was Parnisa and the Macedonians called it Pelli, and is it was surrounded by water, it was denominated *Cheroneus*.

**APANAGL** or **APPENNAGE** in the French customs, were lands assigned by the sovereign for the subsistence of his younger sons which were to revert to the crown upon the failure of male issue in that branch to which the lands were granted.

**APATHIROPY**, denotes a love of solitude, and aversion from the company of mankind.

**APARGIA** In botany, a genus of the class and order syngenesia polygama equals. Receptacle naked calyx imbricate, down feathery, sessile. Seventeen species, chiefly natives of the Barbary coast and south of Europe. The following are produced in our own country.

*A. lutea*, on our mountains in autumn; *a* *spida*, in our meadows; *a* *spida*, in our pastures.

**APARINF**, (*aparine* *Απαριν*, from *gum*, *a* *fil* because its bark is rough and raspy like a file) Clovers, or goose grass. This plant, which is common in our hedges and ditches, is the *gallium aparine*, *foliis octonis lanceolatis*, *caulis scabris retroscissimulatis*, *geniculis venosis fructu hispidis*, of *Linneus*. The expressed juice has been given with advantage as an apertient and diuretic in incipient dropsies, but the character in which it has of late been chiefly esteemed is that of an antiepileptomatous remedy. A tea-cup full, gradually increased to half a pint two or three times a day, is said upon good authorities to have cured cancer.

**APARITHMESIS**, in rhetoric denotes the answer to the protasis or proposition itself. Thus, if the protasis be, *Apparandi tempus non erat*,—The apparithmesis is, *At tecum amo plus vixi*.

**APARI**, *ad* (*apart*, French) 1 Separately from the rest in place (*claren*) 2 In a state of distinction (*Dyden*) 3 At a distance, retired from the other company (*Shakspeare*).

**APARISMENUS**, in the ancient poetry, an appellation given to a verse, which comprehended an entire sense or sentence in itself. This is sometimes also written *apartemenus*, *i* *e* suspended, as not needing any subsequent verse.

**APARTMENT**, a portion of a large house, wherein a person may lodge separately, having all the conveniences requisite to make a complete habitation.

**APATE**, a tribe of *Fabricius*. See **DERMESTES**.

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**APATHY**, among the ancient philosophers, implied in utter privation of passion, and insensibility to pain. The word is compounded of *a priv* and *pathos* affection. The Stoics affected an entire apathy. They considered it as the highest wisdom to enjoy a perfect calmness or tranquillity of mind, incapable of being ruffled by either pleasure or pain. In the first ages of the church, the Christians adopted the term apathy to express a contempt of all earthly concerns.

**APATURIA**, a solemn feast celebrated by the Athenians in honour of Bacchus, this feast lasted four days. Its origin is uncertain.

**APALLIA**, in antiquity, the day of a marriage solemnity, whether the second or third is not certain, on which the bride presented her bridegroom with a garment called *apallia*.

**APE** *s* (*ape*, Icelandic) 1. A kind of monkey. (See *SIMIA*) 2. An instructor.

*To APE* *v* *a* (from *ape*) To imitate, as an ape imitates human actions. (Addison)

**APEAK** *ad* (*a pē a*, Fr.) In posture to pierce, formed with a point.

**APLII** A of the Buzians. See *STOBYAR*.

**APLLIS**, a celebrated painter of Colours, as others say, of Iphesus, son of Pnyx. He lived in the age of Alexander the Great, who honoured him so much that he took any man but Apelles to draw his picture. He was so attentive to his profession that he never spent a day without employment in his pencil, whence the proverb of Nicias is derived. His most perfect picture was Venus Anadyomene, which was not totally finished when the painter died. He made a painting of Alexander holding thunder in his hand, so much like life, that Pnyx, who was it said that the hand of the king with the thunder seemed to come out of the picture. This picture was placed in Diana's temple at Iphesus. He painted another of Alexander, but the king expressed not much satisfaction at it, and at that moment a horse passing by, neighed at the horse which was represented in the piece, supposing it to be a real one, upon which the painter said, "one would imagine that the horse is a better judge of painting than your majesty." He wrote three volumes upon painting, which were not extant in the age of Pliny. Apelles never put his name to any pictures but three, namely, a sleeping Venus, Venus Anadyomene, and Alexander. (*Philo* &c.)

**APELLIGÆ**, in the primitive character denote those who taught, in the tradition that Christ left his body delivered to the apostles, and so ascended into heaven without it.

**APLNI**, in antiquity, a superstitious notion, whence the images of the gods were carried in procession on certain days.

**APFINES** See *APFININE*.  
\* *APIN* *ph* *A* (*apipata*, *ap* *fin*, *fin* *o*, *priv* and *ap*, *to digest*) Indigestion.

**APIR**, in zoology, a synonym of the *Sus scrofa*. See *SUS*.

**APERUVIS**, (*απερυσ*, from *απερυσσους*, *to crush*) Eruption.

**APERIENS PALPEBRARUM REC-**

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**TUS** See *LEVATOR PALPEBRÆ SUPERIORIS*.

**APERIENTS**, (*aperient a*, *sc* *meacamentis*, from *aperio*, to open) Purgatives. Laxatives. Medicines which gently open the bowels, such as magnesia, electuarius cassia, electuarius cenna, kali vitriolatum &c.

**APERTIONS**, in architecture, the openings in a building as for windows doors &c. It is a maxim that these should not be numerous, nor approach too near the angles of the walls.

**APERIURE** *v* The opening of any thing, or a hole, cleft, or vacant place, in some otherwise solid or continuous subject. The word comes from *aperire*, to open.

**APERIURE** in conictry, is used for the space left between two lines which mutually incline towards each other to form an angle.

**APERIURE** in optics is the hole in the object glass of a telescope or nucleus opening, through which the light and the image of the object come into the tube, and are thence conveyed to the eye.

Aperture is also understood of that part of the object glass in which covers the former, and which is left previous to the rays.

A great deal depends upon having a just aperture — To find it experimentally Dr Hutton gives in his Mathematical Dictionary the following excellent rule. Apply several circles of dark paper of various sizes, upon the face of the lens from the breadth of a straw to such is leave only a small hole in the glass, and with each of these separately, view some distant objects, as the moon stars &c, then that aperture is to be chosen through which they appear the most distinctly.

Huygens first found the use of apertures to conduce much to the perfection of telescope, and he found by experience (Dioptr. prop. 50) that the best aperture for an object-glass for example of 30 feet, is to be determined by this proportion, As 30 to 3 so is the square root of 30 times the distance of the focus of my lens, to its proper aperture, and that the focal distance of the eye glasses are proportional to the apertures. And M. Anzout says he found by experience that the apertures of telescope ought to be nearly in the subduplicate ratio of their lengths. It has also been found by experience that object glasses will admit of greater aperture if the tubes be blacked within and their pistons furnished with wooden rim.

It is to be noted that the greater or less aperture of an object glass does not increase or diminish the visible area of the object, although it is affected by this is the admittance of more or fewer rays, and consequently the more or less bright appearance of the object. But the irregularity of the aperture or focal distance, causes the irregularity of its refractions. Hence, in viewing Venus through a telescope, a much less aperture is to be used than for the moon or Jupiter, or Saturn, because her light is so bright and glaring. And this circumstance somewhat invalidates and disturbs Anzout's proposition, as is shewn by Dr Hook, Philos. Trans. No 4.

# A P E R T U R E

**APERTURE**, in hydraulics, the hole or orifice in the bottom or side of a vessel, through which a fluid issues. The determination of the velocity and other circumstances attending liquids flowing through such apertures is a matter of no small labour and difficulty. The subject was investigated by Newton in his *Principia*, and subsequently by Daniel Bernoulli and D'Alembert, each of whom made valuable additions to the propositions of Newton. But since this has been found that no satisfactory result could be obtained from the ordinary, or direct class of investigators have deduced chiefly from experiment the general laws by which the phenomena appear to be regulated. Among this latter class of investigators the chevalier de Bait, citizen Venturi, and Mr Eytelwein, in numerous German works, the most noted. The late gentleman having properly combined theory with experiment has given much curious and useful information in his *Handbuch der Mechanik und der Hydraulik*, we shall in this place state a few of his results.

Newton shewed that the velocity of water flowing out of a horizontal aperture is the square root of the height of the head of water, or that the pressure and consequently the height is as the square of the velocity. And the proposition thus stated is fully confirmed by Boerhaave's experiment, the proportion being with pressure of 1, 4 and 9 feet being 27.22, 54.40, and 81.63, instead of 27.22, 54.44 and 81.69, a very inconsiderable difference. In the same case the velocity flow out must be nearly equal to that of a heavy body falling from the height of a head of water, and which I found very nearly by multiplying the square root of that height in feet by 8, for the number of feet descended in a second. Thus 1 foot of one foot gives 8, a head of 9 feet 24. If I though we must not neglect all the circumstances (of which we shall presently speak more at large), namely, the contraction of the stream or vein of water, after it has passed the aperture. This contraction out of a simple orifice in a thin plate, reduces the diameter of the stream at the distance or about half the diameter from the orifice, from 1 to .60 or .61, according to Boerhaave, to .617 according to Venturi, and to .64 or .65, according to my own experiments; hence the diameter is reduced to  $\frac{1}{2}$ . The quantity of water discharged is very nearly, but not quite, sufficient to fill this contraction with the velocity due, or corresponding to the height thereof, to find more accurately the quantity discharged the orifice must be supposed to be diminished to .610 or nearly  $\frac{1}{2}$ , and hence we may multiply the square root of the height by  $\frac{1}{2}$  instead of 8, for this may velocity in a simple aperture.

If I apply the shortest pipe that will connect the stream to adhere every where to its sides, which will require its length to be twice its diameter, the discharge will be about  $\frac{1}{2}$  of the full quantity, and the velocity may be found by taking  $6\frac{1}{2}$  for a multiplier. The greatest diminution is produced by inserting a pipe so as to

project within the reservoir, probably because of the greater interference of the motions of the particles approaching its orifice in the regions in this case the discharge is reduced nearly to a half. A conical tube approaching to the figure of the contraction of the stream, procured a discharge of .02, and when its edges were rounded off, of .08, calculating on its least section. Venturi has asserted that the discharge of a cylindrical pipe may be increased, by the addition of a conical tube nearly in the ratio of 5 to 2, but Eytelwein finds this assertion rather too strong, and says that when the pipe is already very long, scarcely any effect is produced by the addition of such a tube. He made a number of experiments, however, which in practice are confirm the assertion that a conical pipe may increase the discharge of twice as much as is much as through a simple aperture, or to more than half as much as it would fill the whole section with the velocity due to the height, so that the observation of Venturi is just except when a considerable length of pipe is used.

1 For narrow openings in a level with the bottom is on a level with the bottom, for bridges with pointed piers, 7, 1 For narrow openings of which the bottom is on a level with that of the bottom, for smaller openings in a sluice with a sill for abrupt projections and square piers of bridge 6, 9 2 For a port piece from two to four times as long as their diameter, 6, 6 0 For openings in sluices without side wall, 5, 7 7 For apertures in a thin plate, 5

Having thus stated the results of Mr Fyfe's observations, we should now close this article were we not convinced that the reader who pursues have taken a scientific turn would complain of us were we to say nothing of the theory. And indeed, on a subject of such importance, a subject which after all, has derived considerable advantages from a judicious application of theory, it would be unpardonable not to appropriate a few lines to the purpose of satisfying the enquiries of the man of science on the difficult point. When water issues from a small aperture in the bottom or side of a vessel which is kept constantly full it has been commonly supposed and asserted that the force accelerating the lowest plate of water (for the fluid has been conceived to act as an infinite number of extremely thin plates or laminæ of matter), of indefinitely little altitude, immediately over the orifice, is the weight of the incumbent water only, and, therefore, that after the motion of the plate has once commenced, the pressure of the incumbent column will be diminished, and of



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consequence the force accelerating the plate, during its descent through its own altitude, will not be constant

But, in fact, it is not the pressure of the incumbent water, which accelerates the lowest plate, for every plate of water immediately incumbent over the hole, abstracting from all lateral pressure, begins to be accelerated equally at the same moment and therefore the incumbent column, exclusive of any lateral pressure, could produce no increase of velocity in proportion to its increased height. The force which really accelerates the issuing plate, is the pressure of the ambient water which surrounds the cylinder immediately over the aperture, and this lateral pressure being communicated to the upper surface of the plate, must be as much increased by the velocity of the superior descending plate, as it is diminished by that of the inferior issuing plate, so as to remain constantly of the same magnitude.

On this principle it can be easily demonstrated, that the velocity with which water spouts from an aperture in the bottom or side of a vessel, is equal to that which a heavy body would acquire in falling through the height of the fluid above the orifice.

This demonstration, however as Mr Atwood observes, is true only on the hypothesis that the water suffers no resistance, but issues in a cylindrical or prismatic form corresponding to the hole. But, in fact, the velocity of the water according to theory will be diminished by the friction of the particles against the edges of the orifice, from their mutual attraction by which the issuing particles are retarded by those which are still in the vessel, and have not acquired the velocity of those which precede them, but principally from the obliquity of their motions.

For, as cheval Du Buat observes, when water issues from an orifice, the particles will flow from all sides, towards the orifice, with an accelerated motion, and in all directions. If the orifice be horizontal, that filament of particles which answers to the centre of the hole will descend in a vertical line, and will suffer no other resistance than that of the friction caused by the excess of its velocity above that of the collateral filaments, or by the retardation which arises from the attraction subsisting between them. The other filaments, after they have descended vertically for some time, are compelled to turn from their vertical course, and to approach the orifice in different curves, and when they arrive at it, their directions become more or less horizontal, according as they pass nearer to or farther from the edge of the orifice. The motion thereof is decomposed according to two directions, the one horizontal, which is destroyed by the equal and contrary resistance of the filaments which are diametrically opposite, the other vertical, in proportion to which the quantity of water discharged is to be estimated. Hence we see, that the vertical velocity of the filaments decreases from the centre of the orifice to its circumference, and that the total discharge is less than if all the fila-

ments had issued vertically in the same manner with that which answers to the centre of the aperture. It also follows, that the filaments which are nearer to the centre, moving faster than those which are nearer to the edges of the vein of the fluid, after it has issued from the orifice, will form a cone whose base is the orifice, that is to say, that its diameter will diminish, at least, to a certain distance, because the exterior filaments are gradually drawn on, in consequence of their mutual attraction, by the interior filaments whose velocity is greater, whence there follows a diminution in the diameter of the vein.

This manner of accounting for the contraction of the vein seems more reasonable than that which is given by Newton, as there appears to be no adequate cause for the acceleration of the water, after it has been discharged from the orifice.

The diminution of the mean velocity of the water, caused solely by the obliquity of the motions of the issuing particles, exclusive of any other impediment, may be thus determined. conceive the aperture to be a horizontal one, nearly in the middle of the bottom of a vessel filled with water. now, in whatever direction the water issues, its velocity in that direction will in all cases, be the same, because the pressure of fluids is the same in all directions, thus, whether a fluid spouts perpendicularly upwards or downwards, horizontally or obliquely, the space through which it is projected, in a given time, is the same. Now to determine this direction, since the horizontal and vertical pressures are equal, the issuing particles will assume the intermediate direction, which will therefore form an angle of  $45^\circ$  with the plane of the orifice. its vertical velocity therefore will be less than its direct or total velocity in the proportion of the diagonal of a square to its side, or as 7 to 5 nearly, but the particles of the central filament issue with the full velocity due to the entire height of the water, therefore the velocity of the central particle will be to the mean velocity as 7 to the mean between 7 and 5, or as 7 to 6. This is the diminution, as has been said which takes place in consequence solely of the obliquity of the motions with which the particles issue from the orifice. If the other causes of retardation be taken into the account, we may conclude, that the velocity should be diminished in the ratio of 8 or even 9 to 6, which accords very well with experiments. Thus, besides the proportions already mentioned in the preceding part of this article, Polenius makes the ratio of the diameters of the contracted vein and aperture, which is the same with that of the mean and greatest velocity, to be as  $5\frac{1}{2}$  to 6 $\frac{1}{2}$ , Bernoulli 5 to 7 cheval Du Buat 6 to 9. When the orifice is infinitely little, the cylinder of issuing water becomes a single filament, which is therefore discharged without any obliquity, and there will be no diminution of velocity, except such as arises from friction and the tenacity of the particles. If the aperture be increased so as to become equal to the

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base of the vessel, the column of water will then descend like a falling body, and therefore the velocity will be the same as before, but it will not acquire this velocity until the uppermost plate of water has been discharged. At the beginning of the motion, the first or lowest plate will flow out with a velocity indefinitely little, the next plate with a greater velocity, and so on, until the upper plate shall have descended to the orifice, which will then issue with the greatest velocity. But if the vessel be supposed to be kept constantly full, the velocity of the effluent water will increase so as at length to become equal to that which a heavy body would acquire in falling from an infinite height.

Since the middle filament of particles is discharged with the full velocity due to the entire altitude of the fluid above the orifice, experiments made on the distance or height to which fluids spout will be found to agree very well with theory, but it by no means follows, that all the filaments should be discharged with the same velocity: the quantity of the fluid therefore discharged in a given time, may be less than that which would be discharged if all the filament were discharged with the velocity due to the entire altitude, because this quantity depends on the mean velocity of all the filaments. Hence, therefore, it cannot be inferred from these experiments compared with those which relate to the height or distance to which the fluid spouts, that the velocity of the water in the orifice is less than that which is due to the entire altitude: and that it is accelerated immediately after it gets out of it, because the distance to which the fluid spouts depend on the central filament only, but the quantity discharged on the mean velocity of the whole.

In the course of the different hydrostatical articles which will fall in the compass of our work, the reader will have frequent occasion to call these observations to mind: if he is desirous to pursue this branch of the subject to greater extent, we refer him to an ingenious paper in vol. vii. of the Irish Transactions, by Dr. Thomas Young, some of whose reasoning we have here adopted. See also Gregory's Mechanics, vol. i.

**APHYMSI NUS** (from  $\alpha\psi\sigma$  and  $\nu\theta\varsigma$ , *strait hit*) A name of the intestinum rectum, or straight gut.

**APH $\epsilon$** , the vertex, tip, or summit of any thing.

**ATEX**, in antiquity, the crest of a helmet, or, a kind of cap worn by the flamens.

**ATEX**, in driving or anatomy, the extremity of a part: it is the apex of the tongue, apex of the nose, &c.

**ATEX**, in botany, the tip or end. When applied to leaves, it is the upper extremity, farthest from the base or insertion. Ray calls the under by this name.

**APHÆRESIS** ( $\sigma$   $\alpha\phi\alpha\epsilon\sigma\varsigma$ ) A figure in grammar, that takes away a letter or syllable from the beginning of a word.

**APHASIA** (from  $\alpha$  and  $\phi\eta\mu\iota$ , *I speak*) In the sceptic philosophy, denotes a state of doubt,

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wherein a person not knowing what to determine on, it is best for him to be silent. In this sense, aphasia stands opposite to phasis, under which are included both assertion and negation.

**APHELION, APHELIA**  $\epsilon$   $\phi\eta\epsilon$  ( $\alpha\phi\epsilon$  and  $\eta\eta\epsilon$ , *the sun*) That part of the orbit of the earth, or a planet, in which it is most remote from the sun. The extremity A of the transverse axis of the elliptical orbit (fig. 2 pl. 5) is the aphelion. It is sometimes spelt iphelium.

The mutual attraction of the planets and satellites upon each other, causes a very minute motion in the places of their aphelia: their motions in longitude having the secular precession of the equinoxes deducted, are all found to be direct: both place and motions are expressed below, for the six chief planets.

Planets	Place of Aphelia, Jan. 1800	Secular Motion Aph
Mercury	5 0 14 50	0 1 33 45
Venus	10 7 59 1	1 21 0
Mars	5 2 24 4	1 51 40
Jupiter	6 11 8 40	1 34 33
Saturn	8 29 4 11	1 50 7
Georgium Sidus	11 16 30 31	1 29 2

The method of ascertaining these particulars, is shown in O. Gregory's Astron. p. 220. Vid. Astron. vol. i. p. 133, &c.

**APHELLAN** the name of a bright star in the constellation Gemini, marked  $\alpha$ .

**APHITHANTHROPY** ( $\alpha$  and  $\phi\iota\alpha\nu\theta\rho\omega\pi\iota\alpha$ ) Want of love to mankind.

**APHIS** Plant louse, pucion, or vine-frater. A genus of the class and order insecta hemiptera: Snout inflexed, sheath of five joints with a single bristle, antennae setaceous, longer than the thorax: wings four, erect, or wingless, legs formed for walking: abdomen with two obtuse, erect horns behind, and often a small style at the tail. The minute animals which compose this extensive genus, infect various plants: usually in large societies, obstructing their growth, and consuming their juices. They are sometimes single, and sometimes in angles: without distinction of sex, in the spring they are viviparous: producing the young alive, in the autumn, and towards winter, when the colder air seems to require a warmer cover and tenderer nursing, they are oviparous, and by a surprising aberration from the common laws of nature, it appears that one impregnation of the female is sufficient for many successive generations, without the farther assistance of the male. Seventy three species, uniformly deriving their specific name from the tree, shrub, or plant, on which they are commonly found. Of these chiefly known

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in our own country, we may select (for some of which see Nat Hist pl XXII)

1 A *silva*, willow louse, found on different species of the tree thus named, length nearly a quarter of an inch, colour yellowish grey, spotted with black. Towards the end of September, multitudes of the full grown insects of this species, both winged and others, desert the willows on which they feed, and roam at large over every neighbouring object in such numbers, that nothing in their vicinity can be handled without crushing some of them, while those in a younger or less advanced state still remain in large masses on the trees

2 A millefolii of Degeer, or yarrow-louse, so named from the plant it selects. Small species, colour green, spotted with black males generally winged, and smaller and slenderer than the females

3 A *tilia*, lime-tree louse. One of the most beautiful of the genus size small, like that of a rose, colour greenish yellow, with a row of black crescent shaped spots down each side of the abdomen, and a black stripe on each side of the thorax wings beautifully transparent, with brown nerves or veins, a black edging down the shoulder part, and several dusky patches towards the tips

4 A *rosæ*, rose-louse very frequent in the summer months on the young shoots and buds of roses size that of a salix, colour bright green, the males furnished with large transparent wings

5 A *vitis*, common vine-fretter almost perpetually found in the summer months on the *vitis vinifera*. Body greenish, back of the abdomen brown and a brown dot between the antennæ. This destructive insect eats through the peduncles or stems which support the clusters of grapes in their very early stage, compelling them to wither away and drop off soon after the fruit is formed

APHONIA (*aphonia*, *αφωνία*, from *α* priv and *φωνη*, the voice) A suppression of the voice, without either syncope or coma. A genus of disease in the class locales, and order dyscrasias of Cullen. When it takes place from a tumour of the fauces, or about the glottis, it is termed *aphonia gutturalis*, when from a disease of the trachea, *aphonia trachealis*; and when from a paralysis, or want of nervous energy, *aphonia atonica*

APHORISM, a maxim, general rule, or principle; of a science, or a brief sentence, comprehending a great deal of matter in a few words. The word comes from *απορίω*, I separate, q. d. a choice or select sentence

APHORISTICAL *a* (from *aphorism*) Written in separate and unconnected sentences

APHORISTICALLY *ad* (from *aphoristical*) In the form of an aphorism (*Hayney*)

APHRODISIA, in antiquity festivals in honour of Venus, celebrated in different parts of Greece, but chiefly in Cyprus. They were instituted by Cinyras, and all those that were initiated offered a piece of money to Venus, as a badge, and received as a mark of the fa-

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vours of the goddess, a measure of salt and a *παλλος*

APHRODISIACAL, APHRODISIACK, *a* (from *Αφροδίτη*, Venus) Relating to the venereal disease

APHRODISIACS (*aphrodisiaca*, *medicamenta*, *αφροδισιακα*, from *αφροδισια*, *venery*) Medicines which excite a desire for venery, as the *meloe vesicatorius* of Linneus

APHRODISIUS, in chronology, the eleventh month of the Bythinian year, beginning July 23

APIRODPTA In zoology, a genus of the class and order *vetres mollusca*. Body creeping oblong, covered with scales, and furnished with numerous bristly fasciculate feet on each side, mouth terminal, cylindrical, retractile, feelers two, setaceous, annulate, eyes four. Nine species, chiefly inhabitants of the European seas. Of these the *aculata* is often found in the belly of the cod-fish, feeds on testaceous animals, and is from four to seven inches long

APHRODITE, in mythology, a name of Venus, derived from *αφρο*, *froth*, because according to the poets Venus was produced from the froth or foam of the sea

APIROSYNI (from *α* priv and *φρον*, the mind) Madness, dotage, absence of reason

APIRUS (*απρος*, from *απο* and *ρην*, to flow forth) Froth, scum, scoria

APIHA (*aphla*, *αφθα*, from *α* priv, to inflame) The thrush. A disease to which children are very subject. It appears in small white ulcers upon the tongue, gums, and around the mouth and palate. It is ranked by Cullen in the class *prexii*, and order *exanthemata*

APHILARIODOEIAE, a sect, sworn enemies of the council of Chalcedon. The word is derived from *αφαις*, incorruptible, and *δοκω*, I imagine and was given them, because they imagined the body of Jesus Christ was incorruptible and impassible, and not capable of death. They arose among the Lutychians, and made their first appearance in the year 535

APHYLANTHES Blue Montpellier pink. In botany, a genus of the class and order *hexandria monogynia*. Corol six-petalled filaments inserted in the throat of the corol, capsule superior, glume of the calyx six valved, imbricate. The only known species is a native of the south of France

APHYLLOUS, APHYLLUS Leafless, destitute of leaves applied to the stem of a plant, and opposed to *foliatus*, leafy

APIYTHIA In botany, a genus of the class and order *monadelphus pentandria*. Calyx large, funnel form, three-cleft, petals three, inverted into and shorter than the calyx, germ inferior, berry one celled, many seeded, seeds imbedded. The only known species is a Cape vegetable, without leaves, stem, or root, parasitical on the roots of the *euphorbia Mauritanica*, flowers sessile, coriaceous, succulent, and eaten by the *Hottentots*

APIARY *s* (from *απρη*, Lat a bee) The place where bees are kept (*Swift*)

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**APICES OF A FLOWER** Little knobs that grow on the tops of the stamens (*Quincy*)

**APICULUM**, in antiquity, a fillet worn by the flamens in summer, in lieu of the apex

**APIECE** *apiece* (a and piece) To the part or share of each (*Hooker Swift*)

**APIEN** (Peter), a German astronomer, was born in Misnia, in 1495, and became mathematical professor at Ingolstadt, where he died in 1552 His *Cosmography* was printed about 1530, after which he published several other learned works He is particularly celebrated as the inventor of a curious instrument, from its figure called *folium populi*, which, by the sun's rays, shewed the hours in all parts of the earth, and even the unequal hours of the Jews

**APIs**, one of the ancient kings of Peloponnesus, son of Phoebus, and descended from Inachus Some say that Apollo was his father, and that he was king of Argos, while others called him king of Sicily, and fix the time of his reign above 200 years earlier, which is enough to shew he is but obscurely known, if known at all He received divine honours after death, as he had been humane to his subjects The country where he reigned was called *Apis*, and afterwards *Pelissari*, *Arion*, or *Argolis*, and it last that of Peloponnesus, from Pelops

**APIS**, is also a god of the Egyptians, worshipped under the form of an ox Some say that Isis and Osiris are the deities worshipped under this name because during their reign they taught the Egyptians agriculture The Egyptians believed that the soul of Osiris was really departed into the ox, where it wished to dwell because that animal had been of the most essential service in the cultivation of the ground, which Osiris had introduced into Egypt (See *OSIRIS*) The manner in which this ox was chosen by the Egyptians, and their mode of worshipping it, are amply detailed in Herodotus, Strabo, Pliny, and other ancient writers

**APIS** Bee A genus of the class and order insecta hymenoptera Mouth horny, jaw and lip membranaceous at the tip tongue inflected, feelers four, unequal, filiform, antennae short, filiform, those of the female subclavate, wings flat, sting of the females and neuters pungent, and concealed in the abdomen See *Nat Hist* pl XXII

The insects of this genus live, some of them, in large societies, and some are solitary their food is the nectar of flowers, honey and ripe fruit, the larva is soft and without feet, the pupa resembles the perfect insect Two hundred and fifty seven species, scattered over the globe, which are thus arranged by Fabricius

**A** Tongue three-cleft, lip elongated and tridactylous

**B** Tongue three-cleft, lip cylindrical, with two membranaceous bristles on each side Andrena

**C** Tongue three-cleft, hind-feelers tongue-shaped Nomada

**D** Tongue five-cleft, feelers very short Apis

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**E** Tongue seven-cleft, lip five-cleft. Eucera

We can only notice the following

**1** A violacea, hairy black wings violet, Inhabits southern Europe, in the trunks of decayed trees, which it perforates longitudinally, and forms numerous nests, in each of which is deposited a single egg, these nests are made of the farina of vegetables, mixt with honey, and are begun from the bottom

**2** A mellifica, honey-bee Common-bee Pubescent, thorax greyish, abdomen brown, hind-shanks ciliate, and transversely striate within Inhabits Europe in hollow trees, but is chiefly kept in hives This well-known and active insect lives among large societies, composed of males or drone, females or queens, and neuters or working bees The drone has no sting, nor are its feet or proboscis adapted for collecting honey or wax, its life is a series of idleness and gluttony The queen has very short wings, and is larger than the others after having destroyed all the rest of the females which are in the larva or pupa state, she remains under the care and protection of the working bees, who feed her, and follow her wherever she goes She lays from three to four thousand eggs in the space of about two months, which she deposits in cells adapted to their several kinds When the bees are too numerous for their accommodation in the hive, the queen becomes agitated and communicates this agitation to her subjects she then rushes out, followed by a multitude of working bees who swarm about her, and when she is fatigued and settles on any place, cling round her, and guard her with the greatest care After this swarm is departed, another queen recently transformed from the pupa state, is set at liberty, and soon migrates with a fresh swarm This is repeated four, and sometimes five times in a single summer season, till the hive becomes weakened and then the remaining queens fight among themselves till only one is left

The working-bees are extremely numerous, and to their skill and industry is committed the formation of the cells, and the collection of wax and honey, and the care of providing and administering food to the queen, the males, and the unhatched worms From the nectar of flowers they procure honey, and from the pollen or dust which covers the stamina of many vegetables, they gather wax The former often partakes of the aroma and qualities of the plant from which it is obtained, and hence in several parts of North America it has very often been found poisonous from the lauro-cerasus, or other poisonous plants having furnished the honey, a fact often adverted to by ancient entomologists The wax is brought home in an unwrought state, in hollows under the thighs, and after being eaten and macerated in the stomach, is discharged in small parcels, and moulded by the jaws into perfect wax

These insects defend the entrance of the hive against all intruders with the most determined

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\* resolution; and keep in imprisonment, and under guard, the young queens, till the old one has disappeared with a swarm. If by any accident, their queen has been destroyed or lost, they become inactive and stupid, and readily adopt any other that may accidentally present herself, or enlarge several of the cells containing the eggs of working bees, and give the larvae issuing from them more abundant nourishment, and of a different quality, by which when they change to flies, they become queens. It is likewise the office of the working bees to destroy all the males when they become useless in regard to propagation, which is done by suddenly attacking them in the autumn with their stings, and casting out their dead bodies. A few females of each hive (few at least comparatively), survive the severity of the winter, and lay the foundation of succeeding progenies and societies. It follows, of course, that a few of the males must be capable of co-existing with them. The antennae of the female have each ten articulations, of the male eleven, of the neuters fifteen.

3. A centumularis, carpenter-bee. Black, abdomen covered beneath with fulvous hair. Inhabits Europe, and forms its nest in the body of an oak, and other timber trees, which it bores into, and after removing the dust, and making the cavity perfectly smooth, it lines it curiously with rose-leaves. It then deposits its eggs, each in a separate cell, and leaving a sufficient quantity of food for the larva, closes up the entrance with rose-leaves, cemented by a glue or paste of its own preparation. The larva, after having consumed all its provision, eats its way out, and soon becomes a perfect insect. For the most accurate details of the organs, habits, and ramifications of this genus the reader may consult Mr John Hunter's paper in the Phil. Trans. 1792, and Mr Kirby's Monographia Apium Anglie.

APIS MUSCA, the bee or fly, in astronomy, a southern constellation, containing two stars of the fourth magnitude, and two of the fifth.

A PISH *a* (from *ape*) 1 Having the qualities of an ape, imitative (*Shakspeare*) 2 Foppish, affected (*Shakspeare*) 3 Silly, trifling (*Glanville*) 4 Wanton, playful (*Prior*)

APISHLY *ad* (from *apish*) In an apish manner, foppishly, conceitedly.

APISHNESS *s* (from *apish*) Mimicry, foppery, insignificance, playfulness.

API'TPAT *ad* (a word formed from the motion) With quick palpitation (*Congreve*)

APIUM Parsley. A genus of the class and order pentandria digynia. Fruit ovate, ribbed, petals inflexed, uniform, involucre one-lobed. Three species.

1. A pium elinum, common parsley. A native of Persia, but now of general growth among ourselves, of which there are three varieties.

2. A graveolens, a very smallage largely cultivated, but useless to our ditches.

3. A pium stratum, a native of New Holland

## A P O

In medicine, the roots, seeds, and fresh plant, are all accounted aperient and carminative.

APLUDA In botany, a genus of the class and order polygamia monœcia. Calyx glume common, two-valved, female stamens sessile, male, peduncled. Male calyxless, corol two-valved, stamens three. Female calyxless, corol two-valved, style one, seed one-coated. Four species, natives of the East or West Indies.

APLUSIRE, or AMPLUSTRE, in the ancient naval architecture, a carved tablet, somewhat after the manner of a shield, fixed by way of decoration to the extremity of a ship's head.

APNEUSIA (*απνοια*, from *a priv* and *πναι*, to breathe) Defect or difficulty of respiration.

APNELA (*απναι*) The same as APNEUSTIA.

APOBAILLION, in antiquity, a farewell speech or poem.

APOBAILLON, in antiquity, temporary bridges for the purpose of passing from the land to ships, or from one ship to another.

APOBOMOI, in antiquity, sacrifices offered on the earth.

APOCALYPSE, REVELATION, the name of one of the sacred books of the New Testament, including revelations concerning several important doctrines of Christianity. The word is derived from *αποκαλυπτω*, to reveal or discover.

This book, according to Irenæus, was written about the year 96 of Christ, in the island of Patmos, whither St John had been banished by the emperor Domitian. But sir Isaac Newton places the writing of it earlier, viz. in the time of Nero. Some attribute this book to the arch heretic Cerinthus; but the ancient unanimously ascribed it to John the son of Zebedee, and brother of James, whom the Greek fathers call the Divine, by way of eminence to distinguish him from the other evangelists. This book has not at all times, been esteemed canonical. But archdeacon Woodhouse, in his Dissertation on the divine origin of this book, in answer to the objections of Michaelis, has, we think, set this question pretty well at rest.

The Apocalypse consists of twenty-two chapters. The three first are an instruction to the bishops of the seven churches of Asia Minor. The fifteen following chapters contain the persecutions which the church was to suffer from the Jews, heretics, and Roman emperors. Next, St John prophesies of the vengeance of God which he will exercise against those persecutors, against the Roman empire, and the city of Rome, which, as the Protestants suppose, he describes under the name of Babylon, the great whore, seated upon seven hills. In the last place, the 19th, 20th, 21st, and 22d chapters, describe the triumph of the church over its enemies, the marriage of the Lamb, and the happiness of the church triumphant.

"It is a part of this prophecy (says sir Isaac Newton), that it should not be understood be-

fore the last age of the world, and therefore it makes for the credit of the prophecy, that it is not yet understood. The folly of interpreters has been to forget times and things by this prophecy, as if God designed to make them prophets. By this rashness they have not only exposed themselves, but brought the prophecy also into contempt. The design of God was much otherwise. He gave this and the prophecies of the Old Testament, not to gratify men's curiosities, by enabling them to foreknow things, but that, after they were fulfilled, they might be interpreted by the events, and his own providence, not the interpreters, be then manifested thereby to the world. And there is already so much of the prophecy fulfilled, that it is many as will take pains in this study, may see sufficient instances of God's providence.

**APOCALYPTICAI** *a* (from *apocalypse*) Containing revelation (*Burnet*)

**APOCALIASIS**, in astronomy, the period of a planet. The word originally denotes the entire resolution of a thing.

**APOCLNOSIS** (*apocnoisis*, *αποκνωση*, from *απο*, and *κνωω*, to cruciate) A superabundant flux of blood or other fluid without pain. The name of an order in the class of Cullen.

**APOCOPE** *s* (*αποκοπη*) A figure in grammar when the last letter or syllable of a word is taken away, as, *apoplexy*.

**APOCKRYMMA** (from *αποκρυπτω*, to spit up) The matter discharged by blowin or pitting up.

**APOCPMPESIS** (from *εποχμπεσις*) The act or effect of blowing or spitting up matter.

**APOCRISIARUS** in antiquity, an officer appointed to carry or deliver the messengers, orders, and answer, of a prince or emperor. This office was instituted in the time of Constantine, or soon after.

**APOCRUSTICK** *a* (*αποκρυστικη*) Endued with a repelling and stringent power.

**APOCRYPHA**, or **AI OC RYPHAL BOOKS**, such as are not admitted into the canon of Scripture, being either not acknowledged as divine, or spurious. When the Jews published their sacred books they only gave the appellations of canonical and divine to such as they then made public, and such as were still retained in their archives they called apocryphal, for no other reason, but because they were not public, so that they might be really sacred and divine, though not promulgated as such.

The Protestants do not only reckon those books to be apocryphal which are esteemed such in the church of Rome, as the prayer of Manasse king of Judah, the third and fourth book of Esdras, St Barnabas's epistle, the book of Hermas, the addition at the end of Job and the 151st Psalm but also Tobit, Judith, Esther, the book of Wisdom, Jesus the son of Sirach, Baruch the prophet, the Song of the Three Children, the history of Susanna, the history of Bel and the Dragon, and the first and second books of Maccabees. It

is not pretended that these books were received by the Jews, or so much as known to them. None of the writers of the New Testament cite or mention them neither Philo nor Josephus speak of them. The Christian church was for some ages an utter stranger to these books. Origen, Athanasius, Hilary, Cyril of Jerusalem, and all the orthodox writers, who have given catalogues of the canonical books of Scripture, unanimously concur in rejecting these out of the canon. And for the New Testament they are divided in their opinions, whether the Epistle to the Hebrews, the Epistle of St James, and the second Epistle of St Peter, the second and third Epistles of St John, the Epistle of St Jude, and the Revelations, are to be acknowledged as canonical or not. The Protestants acknowledge such books of Scripture only to be canonical as were so esteemed to be in the first ages of the church. The several Epistles abovementioned, and the book of Revelations, whatever the sentiments of some particular persons are or may have been of them, are allowed by all the reformed churches to be parts of the canon of the New Testament.

According to the sixth article of the church of England the Apocryphal books are not to be applied to establish any doctrine, but to be read for example of life, and instruction of manners. But we can hardly help doubting whether even this is not a greater honour than the major part of these books deserve for the historical books are rather to be considered as romances than real histories and in the moral book, under semblance of virtue, it is not unusual to find vice and superstitious practices recommended. So that it is to be feared the prevailing custom of binding up these books with the genuine and inspired books of Scripture, has a strong tendency to weaken the credit and veneration due to the latter, and puts into the hands of the infidel an additional pretence for treating the whole as the bungling inventions of priests or as "old wives' fables."

**APOCRYPHALITY** *cl* (from *apocryphal*) Uncertainty, not indisputably.

**APOCRYPHANESS** *s* (from *apocryphal*) Uncertainty, doubtfulness of credit.

**APOCYFYSIS** (from *αποκνωση*, to bring forth) Parturition.

**APODAILA**, **APODALS**. An order of the Linnéan class pisces, thus ordinarily characterised gills bony, vent fins none. It is from this last feature the name is derived. See **ZOOLOGY**.

**APODECTA**, in antiquity ten general receivers appointed by the Athenians to receive the taxes, &c.

**APODECTI**, officer appointed at Athens to see that the measures of corn were just.

**APODIS** (from the privative *α* and *ποδω*) A general term to denote things without feet.

**APODIXIS**, in middle age writers, a receipt for money paid. Sometimes it denotes a satisfactory proof. Hence the term apodictic.

cal, importing a demonstrative proof, or systematical way of teaching

**APODOSIS**, in rhetoric, makes the third part of a complete exordium, being properly the application, or restriction of the protasis. The apodosis is the same with what is otherwise called axiosis, and stands opposed to protasis e.g. protasis, all branches of history are necessary for a student, catastrophe, so that, without these, he can never make any considerable figure, apodosis, but literary history is of a more especial use, which recommends it, &c

**APODYTERIUM**, in the ancient baths, the apartments where persons dressed and undressed

**APOGEE**, **ΑΠΟΓΕΥΜ**, in astronomy, that point in the orbit of the sun, moon, &c which is farthest distant from the earth. It is at the extremity of the line of the apses, and the point opposite to it is called the perigee, where the distance from the earth is the least

The ancient astronomers, considering the earth as the centre of the system, chiefly regarded the apogee and perigee but the moderns, placing the sun in the centre, change these terms for the aphelion and perihelion. The apogee of the sun, is the same thing as the aphelion of the earth, and the perigee of the sun is the same as the perihelion of the earth

*Motion of the Moon* **APOCEE** See **MOON**

**APOGRAPH**, a copy or transcript of some book or writing. The word is formed of *apo*, at, from, and *γραφω*, I write. In this sense, apograph stands opposed to autograph, as a copy to an original

**APOGALACTISM** (from *apo* and *γαλακτισω*, to suckle with milk) Ablactation, or weaning a child from the breast

**APOLEPSIS** (*αποληψις*, *αποληψις*, from *απο* and *λαμβάνω*, to take from) An interception, suppression, or retention of urine, or any other natural evacuation

**APOLIDES**, those divested of the privileges of Roman citizens

**APOLLINARIAN GAMES**, games at Rome, celebrated yearly in honour of Apollo, on the fifth day of July, under the direction of the prætor, in the Circus maximus. They were instituted in the year of Rome 742, and were merely scenic, no combats, or other exercises, being performed at them

**APOLLINARIANS**, **APOLLINARISTS**, called also by Epiphanius *Dimitræ*, ancient heretics, who denied the proper humanity of Christ, and maintained that the body which he assumed was endowed with a sensitive, and not a rational soul, but that the Divine Nature supplied the place of the intellectual principle in man. This sect derived its name from Apollinaris, bishop of Laodicea, in the fourth century

**APOLIO**, in mythology, a pagan deity worshipped by the Greeks and Romans. He is the reputed son of Jupiter and Latona, called also *Phœbus*, is often confounded with the sun. According to Cicero, 3 de Nat. Deor. there were four persons of this name. To the son of

Jupiter and Latona, however, all the actions of the others seem to have been attributed. When Latona was pregnant by Jupiter, Juno, who was ever jealous of her husband's amours, raised the serpent Python to torment Latona, who was refused a place to give birth to her children, till Neptune, moved at the severity of her fate, raised the island of Delos from the bottom of the sea, where Latona brought forth Apollo and Diana. As soon as he was born, Apollo destroyed with arrows the serpent Python, which Juno had sent to persecute Latona. Hence he was called Pythius. Apollo was the god of all the fine arts, of medicine, music, poetry, and eloquence of all which he was deemed the inventor. He had received from Jupiter the power of knowing futurity, and he was the only one of the gods whose oracles were in general reputed over the world. When his son Asclepius had been killed with the thunders of Jupiter, for raising the dead to life, Apollo, in his resentment, killed the Cyclops who had fabricated the thunderbolts. Jupiter was incensed at this act of violence, and he banished Apollo from heaven and deprived him of his dignity. The exiled deity came to Admetus, king of Thessaly, and hired himself to be one of his shepherds, in which ignoble employment he remained nine years. During his residence in Thessaly he rewarded the tender treatment of Admetus. He assisted Neptune in building the walls of Troy, and when he was refused the promised reward by Homerodorus, he destroyed the inhabitants by a pestilence. Apollo is generally represented with long hair, full beard, with a handsome shape, holding in his hand a bow, and sometimes a lyre, his head is generally surrounded with beams of light. He had temples and statues in every country, particularly in Egypt, Greece, and Italy. The cock, the grasshopper, the wolf, the crow, the swan, the hawk, the olive, the laurel, the palm-tree, &c. were sacred to him, and in his sacrifices, wolves and hawks were offered as they were the natural enemies of the flocks over which he presided. Ballocks and lambs were also immolated to him. As he presided over poetry, he was often seen on mount Parnassus with the nine Muses. His most famous oracles were at Delphi, Delos, Claros, Tenedos, Cyrrha, and Patara. His most splendid temple was at Delphi, where every nation and individual made considerable presents when they consulted the oracle. He had a famous Colossus in Rhodes, which was one of the seven wonders of the world.

**APOLLODORUS**, a famous grammarian of Athens, who flourished about 104 years before Christ. Of all his works, only three books of his Bibliotheca, concerning the original of the gods, are extant, the best edition of which is that of Gale, 1675.

**APOLLODORUS**, a famous architect, was born at Damascus, and lived under Trajan and Adrian. He was employed by the former to build the great bridge over the Danube, and other structures. His bluntness proved his ruin, for when Adrian sent him the design of a



temple of Venus, which he had just built, the architect found that it was too small for the size of the statues, and said, "that if the goddesses should have a mind to rise and go out, they could not." This provoked the emperor so much, that he banished him, and afterwards caused him to be put to death.

**APOLLONIA**, a festival at Argileia in honour of Apollo and Diana. It arose from this circumstance: these two deities came to Argileia after the conquest of the serpent Python, but they were frightened away, and fled to Crete. Argileia was soon visited with an epidemical distemper, and the inhabitants, by advice of their prophets, sent seven chosen boys, with the same number of girls, to entreat them to return to Argileia. Apollo and Diana granted their petition in honour of which a temple was raised to them, the goddess of persuasion, and every year, a number of youths of both sexes were chosen to march in solemn procession, as if anxious to bring back Apollo and Diana.

**APOLLIONIAN** (Hyperbolic and Parabolic). See **HYPERBOLA**, &c.

**APOLLONIUS**, of Perga, a city in Pamphilia, was a celebrated geometrician who flourished in the reign of Ptolemy I Soter, about 240 years before Christ, being about 60 years after Euclid, and 30 years later than Archimedes. He studied a long time in Alexandria under the disciples of Euclid, and afterwards he composed several curious and ingenious geometrical works, of which only his books of Conic Sections are now extant, and even these not perfect. For it appears from the author's dedicatory epistle to Euergetes, a geometrician in Pergamus, that this work consisted of eight books, only seven of which however have come down to us.

From the collections of Pappus, and the Commentaries of Eutocius, it appears that Apollonius was the author of various pieces in geometry, on account of which he acquired the title of the Great Geometrician. His Conics were the principal of them. Some have thought that Apollonius appropriated the writings and discoveries of Archimedes, Hærchæus, who wrote the life of Archimedes, affirms it, though Eutocius endeavours to refute him. Although it should be allowed a groundless supposition, that Archimedes was the first who wrote upon conics, notwithstanding his treatise on conics was greatly esteemed, yet it is highly probable that Apollonius would avail himself of the writings of that author, as well as others who had gone before him: and upon the whole, he is allowed the honour of explaining a difficult subject better than had been done before, having made several improvements both in Archimedes's problems, and in Euclid. His work upon conics was doubtless the most perfect of the kind among the ancients, and in some respects among the moderns also. The other writings of Apollonius, mentioned by Pappus, are, 1 The Section of a Ratio, or Proportional Sections, two books. 2 The Section of a Space, in two books. 3

Determinate Section, in two books. 4 The Tangencies, in two books. 5 The Inclinations, in two books. 6 The Plane Loci, in two books. A magnificent edition of the eight books of the Conics was published in folio by Dr Halley at Oxford, in 1710, the eighth being restored by himself.

**APOLLONIUS RHODIUS**, the author of the Argonautics, was born at Alexandria in Egypt; he taught rhetoric at Rhodes, and hence was called Rhodius. He flourished about the 137th olympiad, and was keeper of the Alexandrian library. Longinus, in his treatise of the Sublime, commends this poet. The ancient scholia upon his Argonautics, still extant, are extremely useful, and full of learning.

**APOLOGÉTICAI, APOLOGÉTICK** a That is said in defence of any thing or person (*Boulev*).

**APOLOGÉTICALY** *ad* (from *apologētical*) In the way of defence or excuse.

**APOLOGIST** *s* (from *apologize*) He that makes an apology.

**TO APOLOGIZE** *v n* (from *apology*) To plead in favour of a person or thing (*Pope*).

**APOLOGUE** *s* (*απολογία*) Fable, story contrived to teach some moral truth (*Locke*).

**APOLOGUS** *s* (*απολογία*, Lat *ἀπολογία*) Defence, excuse (*Tillotson*).

**APOMFCOMETRY** *s* (*απο, from, μέτρον, distance, and μέτρον, to measure*) The art of measuring things at a distance.

**APONEUROSIS** (*aponeurosis, απονευρωσις, from απο, from, and νευρον, a nerve, from an erroneous supposition of the ancients, that it was formed by the expansion of a nerve*) A tendinous expansion.

**APONOGETON** In botany, a genus of the class and order dodecandria tetragynia. Ament composed of scales, cilyless, corolless, capsules from three to four seeded. Four species, natives of India, or the Cape. The white flowers of the distachyon (a Cape plant), are highly fragrant, and its bulbs are eaten roasted.

**APOPHASIS** *s* (Iat *αποφασις*) A figure by which the orator seems to wave what he would plainly insinuate (*Smith*).

**APOPHASIS**, in ancient law, the account given of estates at the exchange of them, called antidosis.

**APOPHIGMATICK** *a* (*απ*) and *φλεγμ* (*μ*) Drawing away phlegm.

**APOPHLEGMATICS** (from *απο* and *φλεγμα, phlegm*) Errhines, medicines which promote the discharge of phlegm from the nostrils.

**APOPHIGMATISM** *s* (*απο* and *φλεγμ* (*μα*)) A medicine to draw phlegm (*Bacon*).

**APOPHOREIA**, presents made to the guests at ancient feasts.

**APOPHILGGM**, a short, wise, and pithy saying. Such is that of Cyrus. He is unworthy to be a magistrate, who is not better than his subjects. Or that of Artaxerxes Mnemon, when reduced to hunger by the loss of his baggage. How much pleasure have I hitherto lived a stranger to! Or that of Cato, Homines

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nihil agendo discunt male agere Or, finally, that of Augustus, Festina lente

**APOPHTHORA** (from *αποφθιρω*, to be abortive) An abortion

**APOPHYGE**, in architecture, a concave part or ring of a column, lying either above or below the flat member Originally this was the ferril fixed on the extremities of wooden pillars to keep them from splitting

**APOPHYSIS** In botany, a process or excrescence from the receptacle of mosses

**APOPHYSIS** (*apophysis*, *αποφυσις* from *αποφύω*, to issue) In anatomy, a process of bone, as the nasal apophysis of the frontal bone, &c

**APOPIE/CIC**, **APOPE/CICAL** a Relating to an apoplexy

**APOPLEXIA** (*αποπληξια*, *αποπλησσειν*, to strike or knock down) In medicine, persons, when seized with this disease, fall down suddenly) Apoplexy A sudden abolition, in some degree, of the powers of sense and motion, with stupor, and sometimes snoring, the respiration and motion of the heart remaining Cullen arranges it in the class neuroses, and order comata When it takes place from a congestion of blood, it is termed apoplexia sanguinea, and when there is an abundance of serum, as in persons of a cold temperament, apoplexia serosa, if it arise from water in the ventricles of the brain, it is called apoplexia hydrocephalica, if from a wound, apoplexia traumatica, if from poisons, apoplexia venenata, if from the action of suffocating exhalations, apoplexia suffocata, if from passions of the mind, apoplexia mentis, and when joined with catalepsy, apoplexia cataleptica

**APOPOMPE**, in antiquity, certain days on which sacrifices were offered to gods called Pompe

**APOPSYCHIA**, in astrology, effluvia pretended to be emitted from the heavenly bodies, and to which their influence is attributed

**APORIA**, in rhetoric, denotes a state of doubt or wavering, wherein the orator appears undetermined whether to say a thing, or not e.g. Floquitur an silcam? Shall I speak out, or hold my tongue?

**APORION**, or **APORIMF**, a problem difficult to resolve, and which has never been resolved, though it be not, in itself, impossible The word is derived from *απορο*, which signifies something very difficult, and unpracticable, being formed from the privative *α* and *πορος*, passage Such we conceive the quadrature of the circle, the duplication of the cube, the trisection of an angle, &c When a question was proposed to any of the Greek philosophers, especially of the sect of academists, if he could not give a solution, his answer was, *απορειν*, q. d. I cannot see through it

**APORRHOEA** (from *απο* and *ρηνω*, to flow) Contamination from stagnant waters

**APOIOPESIS**, in rhetoric, otherwise called reticency, and suppression, a figure, by which a person really speaks of a thing, at the same time that he makes a show as if he would

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say nothing of it The word comes from *αποποιω*, I am silent

**AOSPHRAGISMA**, in antiquity, the figure, or impression, of a seal It was forbid among many of the ancients to have the image of God on their rings and seals

**APOSTASIS**, in physic, usually signifies the same with abscess

**APOSTASY** (*αποστασις*) Departure from what a man has professed It is most generally applied to a renunciation of religion The primitive church distinguished several kinds of apostasy The first, of those who went over entirely from Christianity to Judaism the second, of those who mingled Judaism and Christianity together the third, of those who complied so far with the Jews, as to communicate with them in many of their unlawful practices, without making a formal profession of their religion the fourth sort consisted of those, who after having been sometime Christians, voluntarily relapsed into paganism

The perversion of a Christian to Judaism, paganism, or other false religion was punished by the emperors Constantius and Julian with confiscation of good, to which the emperors Theodosius and Valentinian added capital punishment, in case the apostate endeavoured to pervert others to the same iniquity A punishment too severe for any temporal laws to inflict and yet the zeal of our ancestors imported it into this country, for we find by Bracton, that in his time apostates were to be burnt to death Doubtless the preservation of Christianity, as a national religion, is itself acted from its own intrinsic truth, of the utmost consequence to the civil state which a single instance will sufficiently demonstrate The belief of a future state of rewards and punishments, the exerting just ideas of the moral attribute of the Supreme Being, and a firm persuasion that he superintends and will finally compensate every action in human life (all which are clearly revealed in the doctrine, and forcibly inculcated by the precepts, of our saviour Christ), these are the solid foundation of all judicial oaths, which call God to witness the truth of those facts, which perhaps may be only known to him and the party attesting all moral evidence therefore, all confidence in human veracity, must be weakened by apostasy, and overthrown by total infidelity Wherefore all affronts to Christianity, or endeavours to depreciate its efficacy, in those who have once professed it, are highly deserving of censure But yet the loss of life is a heavier penalty than the offence, taken in a civil light, deserves, and, taken in a spiritual light, our laws have no jurisdiction over it This punishment, therefore, has long ago become obsolete, and the offence of apostasy was for a long time the object only of the ecclesiastical courts, which corrected the offender pro salute animæ But about the close of the last century, the civil liberties to which we were then restored being used as a cloak of mali-

iousness, and the most horrid doctrines subversive of all religion being publicly avowed both in discourse and writings, it was thought necessary again for the civil power to interpose, by not admitting those miscreants to the privileges of society, who maintained such principles as destroyed all moral obligation. To this end it was enacted by statute 9 and 10 W III c 32 That if any person educated in, or having made profession of, the Christian religion, shall by writing, printing, teaching, or advised speaking, deny the Christian religion to be true, or the holy Scriptures to be of divine authority, he shall upon the first offence be rendered incapable to hold any office or place of trust, and, for the second, be rendered incapable of bringing any action, or of being guardian, executor, legatee, or purchaser of land, and shall suffer three years imprisonment without bail. To give room however for repentance, if within four months after the first conviction, the delinquent will in open court publicly renounce his error, he is discharged for that offence in all directions.

**APOSTATE** *s* (*apostata*, Lat *αποστατη*) One that has forsaken his profession, one that has left his religion (*Reverend*)

**APOSTATICAL** *a* (from *apostate*) After the manner of an apostate (*Sandys*)

**To APOSTATIZE** *v* *n* (from *apostate*) To forsake one's profession or religion (*Beut*)

**APOSTOLIA** (*apostolia*, *αποστολια*, from *αποστολη*, *to eccede*) The term given by the ancients to abbeys in general. See **ABBEY**

**To APOSTATIZE** *v* *n* (from *apostome*) To become an apostate, to swell and corrupt into matter (*Heismann*)

**APOSTIMATION** *s* (from *apostemati*) The formation of an aposteme (*Grove*)

**A POSTERIORI** See **DEMONSTRATION**

**APOSTOLI**, *αποστολοι*, one of the twelve disciples of Jesus Christ, commissioned by him to preach his gospel, and propagate it to all the parts of the earth. The word originally signifies a person delegated or sent, from *αποστολην* *mission*, in which sense it occurs in Herodotus, and other profane authors. Hence, in the New Testament, the term is applied to divers sorts of delegates, and to the twelve disciples by way of eminence.

Our blessed Lord selected twelve out of the number of his disciples to be invested with the apostleship. Their names were Simon Peter, Andrew, James the greater, John, Philip, Bartholomew, Thomas, Matthew, James the less, Jude, surnamed Lebbaeus or Thaddæus, Simon the Canaanite, and Judas Iscariot. Of these, Simon, Andrew, James the greater, and John, were fishermen, and Matthew a publican, or receiver of the public revenues of what profession the rest were, we are not told in Scripture, though it is probable they were fishermen.

There are various conjectures as to the reason of our Saviour's making choice of twelve apostles. The most probable is, that it might be an allusion to the twelve patriarchs, as the

founders of their several tribes; or to the twelve chief heads or rulers of those tribes, of which the body of the Jewish nation consisted.

This opinion seems to be countenanced by what our Saviour tells his apostles, that "when the Son of man shall sit in the throne of his glory, they also shall sit upon twelve thrones judging the twelve tribes of Israel."

St Paul is frequently called the Apostle, by way of eminence, and the apostle of the Gentiles, by reason his ministry was chiefly made use of for the conversion of the Gentile world, is that of St Peter was for the Jews, who is therefore styled the apostle of the circumcision. The several apostles are usually represented with their respective badges or attributes. St Peter with the keys, St Paul, with a sword, St Andrew, with a cross or saltire, St James minor, with a fuller's pole, St John, with a cup, and winged serpent flying from it, St Bartholomew, with a knife, St Philip, with a lozenge, whose upper end is formed into a cross, St Thomas, with a lance, St Matthew, with a hatchet, St Matthias, with a battle-axe, St James major, with a pilgrim's staff, and a gourd bottle, St Simon, with a saw; and St Jude with a club.

This appellative was also given to the ordinary travelling ministers of the church. Thus St Paul, in the Epistle to the Romans, *ad Rom. 7* s. s, Salute Andronicus and Junia, my kinsmen and fellow-prisoners, who are of note among the apostles.

**APOSTLE** is used among the Jews for a kind of officer anciently sent into the several parts and provinces in their jurisdiction, by way of visitor or commissary, to see that the laws were duly observed, and to receive the monies collected for the reparation of the temple, and the tribute payable to the Romans.

**APOSTLE**, in the Greek liturgy, is particularly used for a book containing the epistles of St Paul, printed in the order wherein they are to be read in churches, through the course of the year. The Apostle of late days has also contained the other canonical epistles, the Acts of the Apostles, and the Revelations.

**APOSTLE** is also thought by many to have been the original name for bishops, before the denomination bishop was appropriated to their order.

**APOSTLES CREED** See **CREED**, **APOSTLES**

**APOSTLES** *s* (from *apostle*) The office or dignity of an apostle (*Locke*)

**APOSTOLICAL**, **AIOSOT'LICK** *a*: (from *apostolich*) Delivered or taught by the apostles (*Hooper Dryden*)

**APOSTOLICAL FATHERS** is an appellation usually given to the writers of the first century who employed their pens in the cause of Christianity.

**APOSTOLICALLY** *ad* (from *apostolical*) In the manner of the apostles.

**APOSTOLICI**, or **APOSTOLICS**, was a name assumed by three different sects, on account of their pretending to imitate the manner and practice of the apostles.

**APOSTOLICUM**, is a peculiar name given to a kind of song or hymn, anciently used in churches. Vossius understands it as spoken of the apostles' creed. Suicer thinks this impossible, for that this creed was then unknown in the churches of the east.

**APOSTOOLIANS**, a sect of the Mennonites, which first sprung up in the year 1664, and derived its name from Apostool, one of the Mennonite ministers at Amsterdam. They concurred with them in doctrine, and admitted to their communion those only who professed to believe all the sentiments which are contained in their public confession of faith.

**APOSTROPHÉ**, in rhetoric, a figure, whereby the orator, in an extraordinary commotion, turns his discourse from the audience, and directs it to some other person, present or absent, living or dead, or to inanimate nature. The word is formed of *apo*, *ab*, *from*, and *τροπή*, *verto*, *to turn*. Thus Cicero, in his oration for Milo, addresses himself to the great patriots who had shed their blood for the public, and calls them to the defence of his client. So the same orator, in his first Catilinarian, directs himself to Jupiter the protector of the city and empire, and beseeches him to repel the parricide, &c.

The poems of Ossian abound with beautiful instances of this figure.

"Weep on the rocks of roaring winds, O maid of Instore! Bend thy fair head over the waves, thou fairer than the ghost of the hulk, when it moves in a sunbeam at noon over the silence of Morven! He is fallen! The youth is low, pale beneath the sword of Cuchullin!"

**APOSTROPHE**, or **APOSTROPHUS**, in grammar, also denotes a note or character placed over a letter, in lieu of a vowel, to denote that the vowel is cut off, and not to be pronounced. As *e* in *for* even, *th'* angelic host, for the angelic, &c. The affluence of frequent apostrophes, so usual among some late English writers, is a great abuse. In prose, apostrophes are indefensible, and tend to vitiate the language; their use in poetry is to reduce a line to the proper measure.

To **APOSTROPHIZE** *v* *a* To address by an apostrophe.

**APOTACTICÆ**, or **APOTACTICI**, an ancient sect, who, affecting to follow the evangelical counsels of poverty, and the examples of the apostles, and primitive Christians, renounced all their effects and possessions. The word is formed from *αποτασσω*, *οι αποτακται*, *to renounce*.

**APOTHECA** (*αποθηκη*, from *αποθηκευ*) A shop or repository where medicines are prepared or sold.

**APOTHECARY** *s* (*apotheca*, Lat. a repository) One who practises the art of pharmacy, or prepares and sells medicines. There are in this profession various degrees, as to employ and extent. Some do little more than make up medicines, according to the prescription of the Dispensatory (compiled by the order of the college of physicians, for their direction) and of those of particular physicians, be-

sides visiting their patients. Others not only prepare almost all kinds of medicines, as well galenical as chemical, but likewise deal in drugs, with all which they supply their brethren in trade, and so become a sort of wholesale dealers, as well as apothecaries. Others again, practise surgery, manmidwifery, and many times even officiate as physicians, especially in the country, and often become men of very large practice, and eminent in their way.

In London, they are one of the city companies, and were first incorporated with the grocers in 1606, in the reign of King James I. but not alone till 1617. They have a hall where there are two fine elaboratories, out of which all the surgeons chests are supplied with medicines for the use of the British navy.

In the year 1712, the 10th of Queen Anne, an act passed for reviving and continuing several acts therein mentioned, one whereof was for exempting the apothecaries from serving the offices of constables and scavengers, and other parish and ward offices, and from serving upon juries, which act was made perpetual in the 9th year of King George I. The apothecaries in England are obliged to make up their medicines according to the formulas prescribed in the Dispensatory of the college of physicians, and are under an obligation to have medicines there enumerated always ready in their shops, and their shops are liable to be visited by the censors of the college, who have it in their power to destroy such medicines as they judge not to be good.

Among the good regulations made in Denmark, that which the apothecaries are obliged to observe is reckoned one of the best for no person can have leave to follow that profession, unless he be approved of by the college of physicians, and confirmed by the king himself. There are but two apothecaries allowed for the city of Copenhagen, and but one in every other considerable town. The magistrates, attended by the doctors of physic, visit their shops and drugs twice or thrice a year, and those drugs that are either stale or bad are seized, and publicly thrown upon a dunghill without the city, and this is a stain upon the character of such apothecary, that is hardly ever wiped off. The price of all drugs is fixed, so that one may, without fear of being imposed upon, send even a child for any drug to an apothecary's shop, where nothing is sold but what is very good, and at a reasonable price. All drugs are sold for ready money, and yet the apothecaries are obliged to register in a book what they sell, to whom, and by what physician's prescription, so that there seldom happens any accident by poison, either accidentally, or with design, and if any such thing happens, it is easily found out, and quickly punished.

**APOTELFISMA**, denotes generally an effect of some cause. Astrologers use it for influences, and their answers deduced from the stars, are called *apotelesmata*, the art of astrology itself being called *apotelesmatica*.

**APOTHEOSIS**, in antiquity, a heathen ceremony, whereby their emperors and great men were placed among the gods. It was one of the doctrines of Pythagoras, which he had borrowed from the Chaldees, that virtuous persons, after their death, were raised into the order of the gods. And hence the ancients deified all the inventors of things useful to mankind, and who had done any important service to the commonwealth. Iiberius proposed to the Roman senate the apotheosis of Jesus Christ, as is related by Eusebius, Tertullian, and St Chrysostom. Juvenal rallying the frequent apotheoses, introduces p. 6. Atlas complaining that he was ready to sink under the prodigious burthen of so many new gods as were almost every day added to the heavens.

Herodotus, lib. iv. gives a minute description of the ceremonies made use of in the apotheosis of the Roman emperor Servius. In general the apotheosis was subsequent to the death of the person deified, but Augustus, and even Iiberius and Nero were deified during their lives. One of the court poets of Augustus speaks of his master's divinity in these terms

—Præsens divus habebitur  
Augustus adjectis Britannis  
Imperio

**APOTHERAPIA**, in ancient gymnastics, the friction or rubbing with oil, before and after bathing.

**APOTHELRUM**, in ancient writers, a sauce prepared of vinegar, mustard, &c.

**APOTOME**, in mathematics, the remainder or difference between two lines or quantities which are only commensurable in power. Such is the difference between 1 and  $\sqrt{2}$ , or the difference between the side of the square and its diagonal. The word is derived from ἀποτμήναι, I cut off. It is used by Euclid, and a pretty full explanation of such quantities is given in the 10th book of his Elements, where he distinguishes six kinds of apotomes, and shews how to find them all geometrically.

**Apotome Prima**, is when the greater term is rational, and the difference of the squares of the two is a square number, as the difference  $3 - \sqrt{5}$ .

**Apotome Secunda**, is when the less number is rational, and the square root of the difference of the squares of the two terms, has to the greater term, a ratio expressible in numbers, such is  $\sqrt{18} - 4$ , because the difference of the squares 18 and 16 is 2, and  $\sqrt{2}$  is to  $\sqrt{18}$  as  $\sqrt{1}$  to  $\sqrt{9}$  or as 1 to 3.

**Apotome Tertia**, is when both the terms are irrational, and, as in the second, the square root of the difference of their squares, has to the greater term, a rational ratio as  $\sqrt{24} - \sqrt{18}$ , for the difference of their squares 24 and 18 is 6, and  $\sqrt{6}$  is to  $\sqrt{24}$  as  $\sqrt{1}$  to  $\sqrt{4}$  or as 1 to 2.

**Apotome Quarta**, is when the greater term is a rational number, and the square root of the difference of the squares of the two terms, has not a rational ratio to it as  $4 - \sqrt{3}$ , where the difference of the squares 16 and 3 is 13, and  $\sqrt{13}$  has not a ratio in numbers to 4.

**Apotome Quinta**, is when the less term is a rational number, and the square root of the difference of the squares of the two, has not a rational ratio to the greater as  $\sqrt{6} - 2$ , where the difference of the squares 6 and 4 is 2, and  $\sqrt{2}$  to  $\sqrt{6}$  or  $\sqrt{1}$  to  $\sqrt{3}$  or 1 to  $\sqrt{3}$  is not a rational ratio.

**Apotome Sexta**, is where both terms are irrational, and the square root of the difference of their squares has not a rational ratio to the greater as  $\sqrt{6} - \sqrt{2}$ , where the difference of the squares 6 and 2 is 4, and  $\sqrt{4}$  to  $\sqrt{6}$  or 2 to  $\sqrt{6}$ , is not a rational ratio.

**APOTOME**, in music, that portion of a tone-major which remains after deducting from it an interval less, by a comma, than a semitone-major. The ancients called other intervals also by this name. The little interval which Runcan terms the inharmonious quarter of a tone, they knew by the appellation of apotome major. And a certain interval still less than this they denominated apotome minor. The former of these intervals was expressed by the ratio  $\frac{13}{12}$ , the latter by  $\frac{128}{125}$ .

The doctrine of apotomes, in lines, as delivered by Euclid in the tenth book, is a very curious subject, and has always been much admired and cultivated by all mathematicians who have rightly understood this part of the Elements, and therefore Peter Ramus has greatly exposed his judgment by censuring that book. And the first algebraical writers in Europe commonly employed a considerable portion of their works on an algebraical exposition of that book, which led them to the doctrine of surd quantities, as Lucas de Burgo, Cardan, Tartalea, Stifelius, Peletarius, &c. See also Pappus, lib. 4, prop. 3, and the introduction to lib. 7, and Dr Wallis's Algebra, p. 109. Hutton's Math. Dict.

**APOZEM** (*apozema*, ἀποζημα, from ἀποζω, to boil) A decoction.

**TO APPAL** *v a* (*appallir*, Fr) To fright, to depress (*Clarendon*).

**APPALLEMENT** *s* (from *appal*) Depression, impression of fear (*Bacon*).

**APPANAGE** *s* (*appanagium*, low Lat) Lands set apart for the maintenance of younger children (*Swift*).

**APPARATION**, in astronomy, is applied to a star or other luminary, on its becoming visible, after it had been hid, or in a state of occultation.

**APPARATUS** *s* (Latin) Tools, furniture, equipage, show (*Pope*).

**APPAREL** *s* (*apparel*, Fr) 1 Dress; vesture (*Shakspeare*) 2 External habiliments (*Tatler*).

**TO APPAREL** *v n* (from the noun) 1. To dress, to clothe (*Samuel*) 2 To cover or deck (*Bentley*).

**APPARENT** *a* (*apparent*, Fr) 1 Plain; indubitable (*Hooker*) 2 Seeming, not real (*Hale*) 3 Visible, not secret (*Atterbury*) 4 Open, evident (*Shakspeare*) 5 Certain; not presumptive (*Shakspeare*).

The apparent state of things (in the third sense of the word) is frequently very different.

from their real state, either as to distance, figure, &c. &c.

*Apparent conjunction* of the planets, is when a right line, supposed to be drawn through their centres, passes through the eye of the spectator, and not through the centre of the earth.—And, in general, the apparent conjunction of any objects, is when they appear or are placed in the same right line with the eye.

*Apparent Diameter* of an object, is not the real length of that diameter, but the angle which it subtends at the eye, or under which it appears. This angle diminishes as the distance increases, so that a small object at a small distance may have the same apparent diameter as a much larger object at a greater distance, provided they subtend the same or equal angles at the eye. If the objects are parallel to each other, their real diameters are, in this case, proportional to their distances. The apparent diameter also varies with the position of the object, and of equal objects at equal distances, those which stand in a position most nearly perpendicular to the line of their direction from the observer, will appear to have the greatest diameter. our idea of the apparent magnitude generally varying nearly as the optic angle.

But although the optic angle be the usual or sensible measure of the apparent magnitude of an object, yet habit, and the frequent experience of looking at distant objects, by which we know that they are larger than they appear, has so far prevailed upon the imagination and judgment, as to cause this too to have some share in our estimation of apparent magnitudes, so that these will be judg'd to be more than in the ratio of the optic angles. See APPARENT MAGNITUDE.

*Apparent Distance*. See DISTANCE.

*Apparent Altitude* of celestial objects is effected chiefly by REFRACTION and PARALLAX, and that of terrestrial objects by refraction. See those words.

*Apparent Figure*, is the figure or shape which an object appears under when viewed at a distance, and is often very different from the true figure. For a straight line, viewed at a distance, may appear but as a point, a surface, as a line, and a solid, as a surface. Also these may appear of different magnitudes, and the surface and solid of different figures, according to their situation with respect to the eye. Thus, the arch of a circle may appear a straight line, a square, a trapezium, or even a triangle, a circle, an ellipsis, angular magnitudes, round, and a sphere, a circle. Also all objects have a tendency to roundness and smoothness, or appear less angular, as their distance is greater. For, as the distance is increased, the smaller angles and asperities first disappear, by subtending a less angle than one minute; after these, the next larger disappear, for the same reason, and so on continually, as the distance is more and more increased; the object seeming still more and more round and smooth. So, a triangle, or square, at a great distance appears only as a round speck, and

the edge of the moon appears round to the eye, notwithstanding the hills and valleys on her surface. And hence it is also, that near objects, as a range of lamps, and such like, seen at a great distance, appear to be contiguous, and to form one uniform continued magnitude by the intervals between them disappearing, from the smallness of the angles subtended by them.

*Apparent Motion*, is either that motion which we perceive in a distant body that moves, the eye at the same time being either in motion or at rest, or that motion which an object at rest seems to have, while the eye itself only is in motion.

The motions of bodies at a great distance, though really moving equally, or passing over equal spaces in equal times, may appear to be very unequal and irregular to the eye, which can only judge of them by the mutation of the angle at the eye. And motions, to be equally visible, or appear equal, must be directly proportional to the distances of the objects moving. Again, very swift motions, as those of the luminaries, may not appear to be any motions at all, but like that of the hour-hand of a clock, on account of the great distance of the objects, and this will always happen, when the space actually passed over in one second of time, is less than about the 14000th part of its distance from the eye, for the hour hand of a clock, and the stars about the earth, move at the rate of 15 seconds of a degree in one second of time, which is only the 13721 part of the radius or distance from the eye. On the other hand, it is possible for the motion of a body to be so swift, as not to appear any motion at all, as when through the whole space it describes there constantly appears a continued surface or solid as it were generated by the motion of the object, like as when any thing is whirled very swiftly round, describing a ring, &c.

Also, the more oblique the eye is to the line which a distant body moves in, the more will the apparent motion differ from the true one. So, if a body revolve with an equable motion in the circumference of the circle ABCD, &c. and the eye be at E in the plane of the circle, (fig 3 pl 5) as the body moves from A to B and C, it seems to move slower and slower along the line AIK, till when the body arrives at C, it appears at rest at K, then while it really moves from C by D to F, it appears to move quicker and quicker from K by L to A, where its motion is quickest of all, after this it appears to move slower and slower from A to N while the body moves from F to H there becoming stationary again, it appears to return from N to A in the straight line, while it really moves from H by I to A in the circle. And thus it appears to move in the line KN by a motion continually varying between the least, or nothing, at the extremes K and N, and the greatest of all at the middle point A. Or, if the motion be referred to the concave side of the circle, instead of the line KN, the appearances will be the same. All this is manifestly referable to the motions, stations, retrogradations, &c. of the planets.

If an eye move directly forwards in one direction, any remote object at rest will appear to move in a parallel line the contrary way. But if the object move the same way and with equal velocity, it will seem to be at rest. If it move the same way with less velocity, it will appear to move backwards with the difference of the velocities. If it move with greater velocity, it will appear to move forwards with the difference of the velocities. And when the object has a real motion contrary to that of the eye, it appears to move backwards with the sum of the velocities. The truth of all this is experienced by persons in a boat moving on water, or in a moving carriage, making observations on distant objects in motion, or at rest.

On the subject of this article, see O Gregory's Astron ch IX

*Apparent Place* of an object, in optics, is that in which it appears, when seen in or through glass, water, or other reflecting, or refracting media. In most cases it differs much from the true place.

*Apparent Station*, in astronomy, the position or appearance of a planet, or comet, in the same point of the zodiac for several days.

If the earth were in the centre of the orbits of the planets, their motions would always be found nearly regular, and we should never observe either stations or retrogradations. But since the situation of an observer on the earth is far from the centre of their orbits, they do not always appear to go forwards, or in consequence but they seem to stand still for a time, after which their motions become retrograde, or in antecedentia. Supposing the earth and planets to move in concentric circles in the same plane, the problem respecting their stations would admit of any easy solution, as will appear from the following considerations.

Let C (fig 4 pl 5) be the sun in the centre of the orbits, and let the planets be found in the points B and H of the circumferences when the one appears stationary to the other. Draw CB and CH, and letting fall the perpendicular CM upon BH, produced if need be, let HP be drawn through the point H parallel thereto, meeting the radius CB in P, from which point, as also from the point O, let PR and OQ be drawn parallel to the line BH, which being done, since the right line bh connecting the extremities of the infinitely small arches Bb, Hh, described by the planets in the same time, is parallel to BH, the small right lines lβ and hφ, drawn through b and h, will be parallel to MC, and equal to each other and besides, because the triangles Bbβ, CBM, and COQ are similar, it will be Bb lβ CO OQ, and the similar triangles Hhφ and HCM give hφ or bβ Hh HM or PR HC or OC, therefore, *ex aquo perturbate*, Bb Hh PR OQ. Now the small arches Bb, Hh described in the same time, are as the velocities with which they are run over, therefore  $\frac{PR}{OQ}$ , or  $\frac{PC}{OC}$  is equal to the quotient of the velocity of the planet B divided by that of

the planet H. hence, putting this ratio of the velocities as 1 to n, it is only necessary to divide the radius OC in P, so that the part PC may be to the whole OC, as 1 to n, and bisecting the remainder BP in S, from this centre with the distance SP, or SB, let the circle BHP be described, it will cut the inferior orbit OY in the desired point H.

The angles in the triangle BCH may be easily found by plane trigonometry, for, because the radii BC, OC, are given, a part thereof  $\frac{OC}{n}$ , which is PC, will be given, and consequently PB, and its half SP or SH. therefore, in the triangle SCH there are given three sides, namely, SC =  $\frac{BC+PC}{2}$ , SH or SP =  $\frac{BC-PC}{2}$ , and CH = OC, whence, we may readily find SCH, and CHH, or its half CBH, from which may also be found the third CHB, or its supplement CHM to two right angles. See also STATIONARY.

APPARENTLY ad (from apparent) Evidently, openly (Tillotson)

APPARITION (Circle of perpetual) See CIRCLE OF PERPETUAL APPARITION

APPARITION, in a general sense, denotes simply the appearance of a thing. In a more limited sense, it is used for a spectre or ghost. — Several instances of apparitions occur in the Bible, that of Samuel, raised by the witch of Endor, has occasioned great disputes.

Mr Andrew Baxter, in his Essay on the Phenomenon of Dreaming, recurs to the principle "that our dreams are prompted by separate immaterial beings, in order to account for apparitions. If the power of such beings be unrestrained, this author maintains that it will equally possess the fancy with delusive scenes without waiting for the occasion of sleep to introduce them, and intrude them forcibly upon the organ amidst the action of external objects. For it requires but a greater degree of the same power to make delusory impressions upon the sensory, while real external objects are making true impressions upon it, than it would require to make the same impressions while no other impression from external objects is made upon it at the same time. Mr Baxter cites the apparition which was presented to Brutus before he came over from Asia, and again the night before the battle of Philippi, the noise as of one entering into his tent which he heard, and the words spoken, "I am, O Brutus, thy evil genius, but thou shalt see me again near Philippi." — The case of Dion, related by Plutarch, is alleged to the same purpose. he was sitting in the porch of his own house in a thoughtful and meditating attitude, when the spectre appeared to him, and this happened while the assassins were contriving his death, a little before he was cruelly murdered. No men in antiquity could be less liable to the suspicion of weakness and credulity than Brutus and Dion, and therefore, according to Mr Baxter, the terror they experienced must have proceeded from



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the power of some superior being Upon the whole he thinks that although *Δειδαιμονία*, or a fear of spirits, hath been much abused by vain or weak people, and carried to an extreme perhaps, by crafty and designing men, the most rigorous philosophy will not justify its being entirely rejected It is true, he adds, no evil can happen to us in God's world, but by our own fault, but that subordinate beings are never permitted or commissioned to be the ministers of his will, is a hard point to be proved See the Essay abovementioned in this very acute author's Inquiry into the Nature of the Human Soul, vol ii

**APPARITOR**, among the Romans, a general term to comprehend all attendants of judges and magistrates appointed to receive and execute their orders Apparitor, in England, is a messenger that serves the process of a spiritual court, or a headle in a university who carries the mace

**APPAUMEE**, in heraldry, denotes one hand extended, with the full palm appearing, and the thumb and fingers at full length

**To APPAY** *v a* (*appayer*, old Fr) To satisfy, to content *obsolete (Milton)*

**To APPEACH** *v a* 1 To accuse, to inform against (*Bacon*) 2 To censure, to reproach (*Dryden*)

**APPEACHMENT** *s* An information made against a person, an accusation

**APPEAL**, in law, the removal of a cause from an inferior to a superior court or judge, when a person thinks himself aggrieved by the sentence of the inferior judge Appeals lie from all the ordinary courts of justice to the House of Lords In ecclesiastical case, if an appeal is brought before a bishop, it may be removed to the archbishop, if before an archdeacon, to the court of arches, and thence to the archbishop and from the archbishops court to the king in chancery

Appeal, in common law, denotes an accusation by a private subject against another for some heinous crime, demanding punishment on account of the particular injury suffered, rather than for the offence against the public—This private process, for the punishment of public crimes, had probably its original in those times, when a private pecuniary satisfaction, called a wergild, was constantly paid to the party injured, or his relations, to expiate enormous offences But the only appeals now in force for things done within the realm, are appeals of felony and mayhem

An appeal of felony may be brought for crimes committed either against the parties themselves or their relations The crimes against the parties themselves are larceny, rape, and arson And for these, as well as for mayhem, the persons robbed, ravished, maimed, or whose houses are burnt, may institute this private process The only crime against one's relation, for which an appeal can be brought, is that of killing him, by either murder or manslaughter But this cannot be brought by any relation, but only by the wife for the death of her husband, or by the heir-male for

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the death of his ancestor, which heirship was also confined by an ordinance of Henry I to the four nearest degrees of blood It is given to the wife on account of the loss of her husband, therefore, if she marry again, before or pending her appeal, it is lost and gone, or, if she marry after judgment, she shall not demand execution The heir, as was said, must also be heir-male, and such a one as was the next heir by the course of the common law at the time of the killing of the ancestor But this rule has three exceptions 1 If the person killed leaves an innocent wife, she only, and not the heir, shall have the appeal 2 If there be no wife, and the heir be accused of the murder, the person, who next to him would have been heir-male, shall bring the appeal 3 If the wife kill her husband, the heir may appeal her of the death And, by the statute of Gloucester, 6 Ed I c 9 all appeals of death must be sued within a year and a day after the completion of the felony by the death of the party, which seems to be only declaratory of the old common law

These appeals may be brought previous to any indictment and if the appellee be acquitted thence, he cannot be afterwards indicted for the same offence For more on the subject of appeal, the reader may consult that article in Tomlins's edition of Jacob's Law Dictionary

**To APPEAR** *v n* (*apparere*, Latin) 1 To be visible to be visible (*Prior*) 2 To become visible as a spirit (*Acts*) 3 To stand in the presence of another, generally of some superior (*Psalms*) 4 To be the object of observation (*Psalms*) 5 To exhibit one's self before a court (*Shak*) 6 To be made clear by evidence (*Spenser*) 7 To seem, in opposition to reality (*Sidney*) 8 To be plain beyond dispute (*Alutnot*)

**APPEARANCE** *s* (from *To appear*) 1 The act of coming into sight 2 The thing seen 3 Phenomenon, any thing visible (*Glanv*) 4 Semblance, not reality (*Dry*) 5 Outside, show (*Rogers*) 6 Entry into a place or company (*Addison*) 7 Apparition, supernatural visibility (*Add*) 8 Exhibition of the person to a court (*Shak*) 9 Open circumstance of a case (*Swift*) 10 Presence (*Addison*) 11 Probability, likelihood (*Bacon*)

**APPEARER** *s* (from *To appear*) The person that appears (*Brown*)

**APPEASABLE** *a* (from *appease*) That may be pacified, reconcilable

**APPEASABLENESS** *s* (from *appease*) Reconcilableness

**To APPEASE** *v a* (*appaiser*, Fr) 1 To quiet, to put in a state of peace 2 To pacify, to reconcile (*Milton*)

**APPEASEMENT** *s* (from *appease*) A state of peace (*Hayward*)

**APPEASER** *s* (from *appease*) He that pacifies he that quiets disturbances

**APPELLANT** *s* (*appello*, Lat to call) 1 A challenger (*Shak*) 2 One that appeals from a lower to a higher power (*Ayliffe*)

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**APPELLANTS**, in church history, an appellation given to such of the catholic clergy as appeal from the constitution Unigenitus to a general council

**APPELLATE** *s* (*appellatus*, Lat) The person appealed against (*Ayliffe*)

**APPELLATION** *s* (*appellatio*, Latin) Name, word by which any thing is called (*Brown*)

**APPELLATIVE NAMES**, in grammar, in contradistinction to proper names, are such as stand for universal ideas, or a whole rank of beings, whether general or special Thus fish, bird, man, city, river, are common or appellative names, and so are trout, eel, lobster, for they all agree to many individuals, and some to many species

**APPELLATIVELY** *ad* (from *appellative*) According to the manner of nouns appellative

**APPELLATORY** *a* (from *appeal*) That contains an appeal

**APPLIÉ** *s* One who is appealed against, and accused

**To APPE'ND** *v n* (*appendo*, Lat) 1 To hang any thing upon another 2 To add to something as an accessory part

**APPENDAGE** *s* (French) Something added to another thing, without being necessary to its essence (*Taylor*)

**APPENDANT** *a* (Fr) 1 Hanging to something else 2 Belonging to, annexed (*Rogers*)

**APPENDANT** *s* That which belongs to another thing (*Grew*)

**To APP'NDICATE** *v a* (*appendo*, Lat) To add to another thing (*Hale*)

**APPENDICATION** *s* (from *appendicare*) Adjunct, appendage, annexion (*Hale*)

**APPENDICULA CACI VERMIFORMIS** A vermicular process, about four inches in length, and the size of a goose quill, which hangs to the intestinum cæcum of the human body

**APPENDICULÆ EPIPLOICÆ** Appendices coli adiposæ The small appendices of the colon and rectum, which are filled with adipose substance See **INTESTINES**

**APP'NDICULATE, APPENDICLED, OR APPENDAGED** (*appendiculatus*) Ramentis foliaceis ad basin This term in botany is applied to a petiole, when it has a small leaf or leaves at the base

**APP'NDIX** *s* **APPENDICES**, plural (Lat) 1 Something appended or added (*Stillingfleet*) 2 An adjunct or concomitant (*Watts*)

The term is chiefly used in matters of literature, for an additional discourse, placed at the end of any piece, or writing, to explain or prosecute something there left deficient, or to draw conclusions therefrom — In which sense the word coincides with supplement

**APPENNINES**, a great chain of mountains which almost divide Italy into two equal parts, running through the whole country, from Savona, in Geneva, to the southern extremity of the kingdom of Naples

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**APPENZEL**, the capital of a canton of the same name in Switzerland It is divided into twelve communities, six of which are Roman Catholics, and six Protestants Lat 47 21 N Lon 9 31 E

**APPERCEPTION, OR ADFFRCEPTION**, a term used by the Leibnitzians for consciousness

**To APPERTA'IN** *v n* (*appartenir*, Fr) 1 To belong to as of right (*Raleigh*) 2 To belong to by nature (*Bacon*)

**APPERTA'INMENT** *s* (from *appertain*) That which belongs to any rank or dignity (*Shakspeare*)

**APPERTINANCE** *s* (*appartenance*, Fr) That which belongs to another thing (*Brown*)

**APPERTINENT** *a* (from *To appertain*) Belonging, relating (*Shakspeare*)

**APP'ETENCE, A'PPEIENCY** *s* (*appetentia*, Lat) Carnal desire (*Milton*)

**APPETIBILI'ITY** *s* (from *appetibile*) The quality of being desirable (*Bramhall*)

**APPETIBI'F** *a* (*appetibilis*, Lat) Desirable, that may be the object of appetite (*Bramhall*)

**APPI'ITE**, in a general sense, the desire of enjoying some object, supposed to be conducive to our happiness When this inclination is guided by reason, and proportioned to the intrinsic value of the object, it is called rational appetite, as on the other hand, it is denominated sensitive appetite, when we have only a blind propensity to a thing, without determinate ideas of the good qualities for which we desire it

Appetites are passions directed to general objects, in contradistinction to passions directed to particular objects, which retain their proper name Thus we say, an appetite for fame, for glory, for conquest, for riches, but we say the passion of love, of gratitude, of envy, &c Appetite may be also distinguished from passion, since the latter has no existence till a proper object be presented, whereas the former exists first, and then is directed to an object

**APPETITE**, in medicine, a certain uneasy sensation excited in the stomach by the calls of hunger An excessive appetite has been called by physicians bulimy or fames canina, a defect or loss of it, anorexy, and that after things improper for food, pica

**APPETITION** *s* (*appetito*, Lat) Desire (*Hammond*)

**APPETITIV'** *a* That does desire (*Hale*)

**APPIAN WAY**, a road reaching from Rome, through Capua, to Brundisium, being nearly 350 miles long This way was paved by Appius Claudius

**To APPLA'UD** *v a* (*applaudo*, Lat) 1 To praise by clapping the hands (*Shakspeare*)

2 To praise in general (*Pope*)

**APPLA'UDFR** *s* (from *applaud*) He that praises or commends (*Glanville*)

**APPLAUS'** *s* (*applausus*, Lat) Approbation loudly expressed, praise It originally denoted that kind of approbation which

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was signified by clapping the hands, still practised in theatres. Applause, in antiquity, differed from acclamation, as the latter was articulate and performed with the voice, the former with the hands. Among the Romans, applause was an artificial musical kind of noise, made by the audience or spectators, to express their satisfaction. There were three species of applause, denominated from the different noises made in them, viz. *bombus*, *imbrices*, and *testæ*, the first a confused clapping, made either by the hands or the mouth, the second and third, by beating on a sort of sounding vessels placed in the theatres for this purpose. Persons were instructed to give applause with skill, and there were even masters who professed to teach the art. At the end of the play, a loud peal of applause was expected, and even asked of the audience, either by the chorus or the person who spoke last.

**APPLE** See **PYRIS**

**APPLE**, *Adam's* See **CITRUS**

**APPLE**, *Blad* See **CACIUS**

**APPLE**, *Custard* See **ANNONA**

**APPLE**, *Love* See **SOLANUM**

**APPLE**, *Mad* See **SOLANUM**

**APPLE**, *Male Balsam* See **MOMORDICA**

**APPLE**, *May* See **PODOHYLLUM**

**APPLE**, *Pine* See **BROMELIA**

**APPLE**, *Purple* See **ANNONA**

**APPLE**, *Soap* See **SAPINDUS**

**APPLE**, *Sour* See **ANNONA**

**APPLE**, *Star* See **CHRYSOPHYLLUM**

**APPLE**, *Sugar* See **ANNONA**

**APPLE**, *Sweet* See **ANNONA**

**APPLE**, *Thorn* See **DATURA**

**APPLE**, *Water* See **ANNONA**

**APPLEBY**, the county town of Westmoreland, having a good corn market on Mondays Lat  $54^{\circ} 34' N$  Long  $2^{\circ} 34' W$  This town contains 1300 inhabitants

**APPLICABLE** *a* (from *apply*) That may be applied, applicable (*South*)

**APPLIANCE** *s* (from *apply*) The act of applying, the thing applied (*Shakspeare*)

**APPLICABILITY** *s* (from *applicable*) The quality of being fit to be applied (*Digby*)

**APPLICABLE** *a* (from *apply*) That may be applied, as properly relating to something (*Dryden*)

**APPLICABLENESS** *s* (from *applicable*) Fitness to be applied (*Boyle*)

**APPLICABLY** *ad* (from *applicable*) In such a manner as that it may be properly applied.

**APPLICATE**, **APPLICATA**, **ORDINATE** **APPLICATE**, in geometry, is a right line drawn to a curve, and bisected by its diameter. This is otherwise called an **ORDINATE**, which see

**APPLICATION NUMBER** See **CONCRETE**

**APPLICATION** *s* (from *apply*) 1 The act of applying any thing to another. 2 The thing applied. 3 The act of applying to any person (*Swift*). 4 The employment of means for a certain end (*Jocke*). 5 Intensity of thought; close study (*Locke*). 6 Attention to some particular affair (*Addison*). 7 Reference to some case or position (*Reg*)

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Some of these senses of the word are enlarged upon in the next succeeding articles

**APPLICATION**, the act of applying one thing to another, either by bringing them nearer together, as in measuring a longer space by the application of a less, or, by shewing the use that is made of one thing in perfecting another, as of the cycloid in improving the doctrine of pendulums

**APPLICATION**, in geometry, is used either for division, for applying one quantity to another, whose areas, but not figures, shall be the same, or, for transferring a given line into a circle, or other figure, so that its end shall be in the perimeter of the figure

**APPLICATION** of one science to another, is the use made of the principles of the one in perfecting the other as in the application of algebra and geometry to mechanics, of mechanic to geometry, of geometry and astronomy to geography, of geometry and algebra to natural philosophy. Instances of these applications will often occur in this work. We may here mention the

*Application of algebra to geometry*, which is of two kinds, that which regards the pline, or common geometry, and that which respects the geometry of curves. In these applications a line whether known or unknown, may be represented by a single letter a rectangle by the product of the two letters representing its sides, and a rectangular parallelopiped by the product of three letters, two of which represent the sides of any of its rectangular bases, and the third the altitude.

These are the most simple expressions of geometrical magnitudes, and any other which has a known proportion to them, may in like manner be expressed algebraically. Conversely, the geometrical magnitudes, represented by such algebraical quantities, may be found, only the algebraical dimensions above the third, not having any corresponding geometrical dimensions, must be expressed by proportionals

The opposite position of straight lines may be expressed by the signs + and -

Thus, let a point A be given in the line

p	A	M	P	B
---	---	---	---	---

AP, any segment AP taken to the right hand being considered as a positive, a segment AP to the left is properly represented by a negative quantity. If *a* and *b* represent two lines, and if, upon the line AB from the point A, AP be taken towards the right equal to *a*, it may be expressed by *a*, then PM taken to the left and equal to *b*, will be properly represented by - *b*, for AM is equal to *a* - *b*. If *a* = *b*, then M will fall upon A, and *a* - *b* = 0. By the same notation, if *b* is greater than *a*, M will fall to the left of A, and in this case, if *2a* = *b*, and if Pp be taken equal to *b*, then *a* - *b* = - *a* will represent Ap, which is equal to *a*, and situated to the left of A.

In the solution of geometrical problems by means of algebra, the following remarks may be advantageously attended to. Compare to-

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gether the quantities concerned in the problem, and making no difference between the known and unknown quantities, consider how they depend upon, or are related to, one another, that we may perceive what quantities, if they are assumed, will, by proceeding synthetically, give the rest, and that in the simplest manner. And in this comparison, the geometrical figure is to be feigned and constructed at random, as if all the parts were actually known or given, and any other lines drawn that may appear to conduce to the easier and simpler solution of the problem. Having considered the method of computation, and drawn out the scheme, names are then to be given to the quantities entering into the computation, that is, to some few of them, both known and unknown, from which the rest may most naturally and simply be derived or expressed, by means of the geometrical properties of figures, till an equation be obtained by which the value of the unknown quantity may be derived by the ordinary methods of reduction of equations, when only one unknown quantity is in the notation, or till as many equations are obtained as there are unknown letters in the notation.

For example, suppose it were required to inscribe a square in a given triangle. Let  $ABC$  (fig. 4 pl. 13.) be the given triangle, and draw  $DEFG$  to represent the required square, also draw the perpendicular  $BP$  of the triangle, which will be given, as well as all its sides. Then, since the triangles  $BAC$ ,  $BFG$ , are similar let the notation be thus: make the base  $AC = b$ , the perpendicular  $BP = p$ , and the side of the square  $DE$  or  $FG = x$ . Hence then  $BQ = BP - PQ = p - x$ , consequently, by the proportionality of the parts of those two similar triangles, viz  $BP : AC :: BQ : EF$ , it is  $p : b :: p - x : a$ , then, multiply extremes and means, &c. there arises  $px = bp - bx$ , or  $bx + px = bp$ , and  $x = \frac{bp}{b+p}$  the side of the square sought, that is, a fourth proportional to the base and perpendicular, and the sum of the two, taking this sum for the first term, or  $AC + BP :: BP :: AC : EF$ .

When algebra is applied to the geometry of curves, the nature of the curve at any time under consideration is to be denoted by its algebraic equation, thus derived: a line is conceived to be drawn, as the diameter or some other principal line about the curve, and upon any indefinite points of this line other lines are erected, either perpendicularly, or under any given angle, which are called ordinates, whilst the parts of the first line cut off by them are called abscissæ. Then, calling any abscissa  $x$ , and its corresponding ordinate  $y$ , by means of the known nature, or relations of the other lines in the curve, an equation is derived, involving  $x$  and  $y$ , with other given quantities in it. Hence, as  $x$  and  $y$  are common to every point in the primary line, that equation, so derived, will belong to every position or value of the abscissa and ordinate, and so is properly

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considered as expressing the nature of the curve in all points of it, and is commonly called the equation of the curve.

In this way it is found that any curve line has a peculiar form of equation belonging to it, which is different from that of every other curve, either as to the number of the terms, the powers of the unknown letters  $x$  and  $y$  or the signs or coefficients of the terms of the equation. Thus, if the curve  $HK$  (fig. 3 pl. 6.) be a parabola, of which  $AP$  is part of the axis, and  $PQ$  a perpendicular ordinate, then put the abscissa  $AP = x$ ,  $PQ = y$ , and the parameter  $= p$ , then the equation of the curve is  $px = y^2$ . See *ABSCISS* and *EQUATION*.

Here also we may add a few remarks, relating to curves in general.

1 If in any case a value of  $y$  vanishes, then the curve meets the base in a point determined by the corresponding value of  $x$ . Hence, by putting  $y = 0$ , the roots of the equation, which in that situation are values of  $x$ , will give the distances on the base from the point assumed as the beginning of  $x$ , at which the curve meets it.

2 If at a particular value of  $x$ ,  $y$  becomes infinite, the curve has an infinite arc, and the ordinate at that point becomes an asymptote.

3 If when  $x$  becomes infinite,  $y$  vanishes, the base is an asymptote.

4 If any values of  $y$  become impossible, then on any intersections of the ordinate and curve vanish. If, at any value of  $x$ , all the values of  $y$  become impossible, the ordinate does not there meet the curve.

5 If two values of  $y$  become equal and have the same sign, the ordinate in that situation either touches the curve, or passes through an intersection of two of its branches, which is called a punctum duplex, or through an oval become infinitely little, called a punctum conjugatum.

In like manner is a punctum triplex, &c. to be determined.

The most valuable concise treatise, on the application of algebra to geometry, with which we are acquainted, is given by Lacroix, at the end of his *Trigonometry*.

**APPLICATIVE** *a* (from *apply*) That does apply (*Bamhall*).

**APPLICATORY** *a* (from *apply*) That comprehends the act of application.

**APPLICATORY** *s* That which applies (*Taylor*).

**APPLY** This term is used two different ways in geometry.

1st, It signifies to transfer or place a given line, either in a circle or some other figure, so that the extremities of the line shall be in the perimeter of the figure.

2d, It is also used to express division in geometry, or to find one dimension of a rectangle, when the area and the other dimension are given. Thus, the area  $ab$  applied to the line

*c* is  $\frac{ab}{c}$ .

**To APPLY**

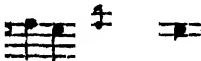

1 To suit, to agree

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(*Shakspeare*) 2 To have recourse to, as a petitioner (*Shelf*) 3 To attach by way of influence (*Rogers*)

To **APPLY** *v a* (*aplico*, Lat) 1 To put one thing to another (*Dryden*) 2 To lay medicaments upon a wound (*Addison*) 3 To make use of as relative or suitable to something (*Dryden*) 4 To put to a certain use (*Clarendon*) 5 To use as means to an end (*Rogers*) 6 To fix the mind upon, to study (*Watts*) 7 To address to (*Milton*) 8 To ply, to keep at work (*Sidney*)

**APPOGIATURE** or **LEANING NOTE**, in music, a note of embellishment in slow movements its chief office is to soften and smooth the effect of certain distances, and by dwelling upon a note of any chord, to retard the completion of the subsequent harmony. In bold and energetic movements, a chain of appoggiatures not only serve to link the greater intervals, but afford the singer or player full scope for the display of flexibility in voice or finger, and for the employment of intonation and impassioned expression. The appoggiature not being always in consonance with the bass and other parts, to avoid a visible breach of the laws of harmony, is generally written in a small note, as in this example

Appoggiature=  

Whatever time is occupied by the appoggiature, or any other grace, so much time is taken from the note it embellishes, so that the time of the whole bar is not augmented

To **APPOINT** *v a* (*appointer*, Fr) 1 To fix any thing (*Galatians*) 2 To settle any thing by compact (*Judge*) 3 To establish any thing by decree (*Samuel*) 4 To furnish in all points to equip, to supply with all things necessary (*Hayward*)

**APPOINTFE**, in heraldry, is when two or more things are placed touching each other at the points or ends

**APPOINTIR** *s* (from *appoint*, He that settles or fixes any thing or place

**APPOINTMENT** *s* (*appointement* Fr) 1 Stipulation (*Job*) 2 Decree, establishment (*Hooker*) 3 Direction, order (*Shakspeare*) 4 Lquipment, furniture (*Shakspeare*) 5 An allowance paid to any man

To **APPORTION** *v n* (from *partio*, Lat) To set out in just proportions (*Colins*)

**APPORTIONMENT** *s* (from *apportion*) A dividing into portions

To **APPOSE** *v a* (*appono*, Lat) 1 To put questions to (*Bacon*, 2 To apply to a Lathum (*Harvey*)

**APPOSER** signifies an examiner In the court of exchequer, there is an officer called the foreign apposer In the office of confirmation, in the first liturgy of Edward VI the rubric directs the bishop, or such as he shall appoint, to appose a child, and a bishop's examining chaplain was anciently called his poser

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**A/POSITE** *a* (*appositus*, Lat) Proper; fit, well adapted (*Wotton Atterbury*)

**A/POSITELY** *ad* (from *apposite*) Properly, fitly, suitably (*South*)

**A/POSITENESS** *s* (from *apposite*) Fitness, propriety, suitableness (*Hale*)

**APPOSITION** *s* (*appositio*, Lat) 1. The addition of new matter (*Arbutnot*) 2 In grammar, the putting of two nouns in the same case

To **APPRAISE** *v a* (*apprecier*, Fr) To set a value upon goods previous to sale

**APPRAISER** *s* (from *ad*, to, and *pretium*, value) One who rates or sets a value upon goods He is generally a broker, upholsterer, or auctioneer, and is employed in cases of death, bankruptcies, &c He takes an oath to do justice between party and party, and is, thence, called *sworn appraiser*

To **APPREHEND** *v a* (*apprehendo*, Lat) 1 To lay hold on (*Taylor*) 2 To seize, in order for trial or punishment (*Clarendon*) 3 To conceive by the mind (*Stillingsfleet*) 4 To think on with terror, to fear (*Temple*)

**APPREHENDIR** *s* (from *apprehend*) Conceiver, thinker (*Glanville*)

**APPRIHE/NSIBLE** *a* (from *apprehend*) That may be apprehended or conceived (*Brown*)

**APPREHENSION** *s* (*apprehensio*, Lat)

1 The mere contemplation of things (*Watts*) 2 Opinion, sentiments (*South*) 3 The faculty by which we conceive new ideas, or power of conceiving them (*Milton*) 4 Fear (*Addison*) 5 Suspicion of something (*Shakspeare*) 6 Seizure (*Shakspeare*)

**APPREHENSIVE** *a* (from *apprehend*)

1 Quick to understand (*South*) 2 Fearful (*Tillotson*) 3 Perceptive, feeling (*Milton*)

**APPRIHENSIVELY** *ad* (from *apprehensive*) In an apprehensive manner

**APPRIHENSIVENESS** *s* (from *apprehensive*) The quality of being apprehensive

**APPRENTICE** *s* (*apprentis*, Fr) One that is bound by covenant to serve another man of trade, upon condition that the tradesman shall instruct him in his art (*Dryden*)

Apprentices may be bound to husbandmen, or even to gentlemen and they, as well as tradesmen, in England, are compellable to take the children of the poor, whom the overseers, with the consent of two justices, may bind till the age of twenty one years Apprentices may be discharged on reasonable cause, but if any, whose premium has been less than ten pounds, run away from their masters, they are compellable to serve out the time of absence, or give satisfaction for it, at any period within seven years after expiration of the original contract Apprentices gain a settlement in that parish, where they last served forty days, and by the 5th of Elizabeth, c 4 they have an exclusive right to exercise the trade in which they have been instructed in any part of England

Apprentices' indentures, and articles of clerkship, pay a stamp duty of seven shillings Pa

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ish indentures are excepted, and pay sixpence only, by 5 W III c 21. In the case of attorneys clerks, there is a further duty of 100l if the articles be in order to admission in the courts at Westminster, and 50l if such articles are in order to admission in any inferior court, holding pleas to the amount of 40s. For fees given with apprentices, clerks, or servants, bound or articulated by indentures, from 1l to 50l masters pay for every pound sixpence, and for fees above 50l one shilling in the pound 8 Ann c 9.

It is enacted by the 5th Eliz c 4 s 31 "That it shall not be lawful to any person or persons, other than such as now do lawfully use or exercise any art, mystery, or manual occupation to set up, occupy, use, or exercise any craft, mystery, or occupation, now used or occupied within the realm of England or Wales, except he shall have been brought up therein seven years at the least, as an apprentice, nor to set any person on work in such mystery, art, or occupation, being not a workman at this day, except he shall have been apprentice, as is aforesaid, or else having served as an apprentice, as is aforesaid, shall or will become a journeyman, or hired by the year, upon pain that every person willingly offending, or doing the contriv, shall forfeit and lose, for every default forty shillings for every month. It is agreed that this statute extends only to such trades as require skill and experience, thus, brewers, bakers, and cooks, when followed as trades, are within the statute, but merchant husbandmen, gardeners, hemp-dressers, &c. are not. See *Companion of Jacob's Dictionary*.

**TO APPRENTICE** *v a* (from the noun) To put out to a master as an apprentice (*Pope*)

**APPRENTICEHOOD** *s* (from *apprentice*) The years of an apprentice's servitude (*Shakspeare*)

**APPRENTICESHIP** *s* (from *apprentice*) The years which an apprentice is to pass under a master (*Dryden*)

**APPROXSED, APPRESSUS, or ADPRESSUS** pressed or squeezed close. Contiguous or laid to, *Wuth*. Applied to a leaf, when the disk approaches so near to the stem, as to seem as if it had been pressed to it by violence. Also to a calyx, when it is close to the peduncle, and to a peduncle, when it is close to the branch or stem.

**APPRISING**, in Scots law, the name of an action by which a creditor formerly became invested with the estate of his debtor for payment.

**TO APPRIZE** *v a* (*appris*, Fr) To inform, to give the knowledge of (*Chaucer*)

**TO APPROACH** *v n* (*approcher*, Fr) 1 To draw near, locally (*Shakspeare*) 2 To draw near, as time (*Gay*) 3 To make progress toward (*Locke*) 4 To come near, by natural affinity, or resemblance.

**TO APPROACH** *v a* 1 To bring near to (*Dryden*) 2 To come near to (*Temple*)

**APPROACH** *s* (from the verb) 1 The act of drawing near (*Denham*) 2 Access

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(*Bacon*) 3. Hostile advance (*Shakspeare*) 4 Means of advancing (*Dryden*)

**Curve of equable Approach**, is the name given to a curve proposed by Leibnitz, down which a body descending by the force of gravity shall make equal approaches to the horizon in equal portions of time. It is also called the isochronous or isochronal curve. Huygens, in 1687, made public the construction and properties of this curve. It is the second cubical parabola, placed with its vertex uppermost, and which the descending body must enter with a certain determinate velocity. In 1689, Leibnitz proposed the para-centric isochronal curve, in which a body would equally approach or recede from a given point in equal times, under any law of gravity. This was solved by the Bernoullis and by Varignon. And Maupertuis resolved the problem in the case of a body descending in a medium, which resists as the square of the velocity. Hist de Acad Sci for 1699 and 1730.

**APPROACHER** *s* (from *approach*) the person that approaches (*Shakspeare*)

**APPROACHES, or LINES OF APPROACH**, are particularly used for trenches dug in the ground, and their earth thrown up on the side next the place besieged, under shelter or defence whereof the besiegers may approach, without loss, to the parapet of the covered way, and plant guns, &c. wherewith to cannonade the place. The lines of approach are to be connected by parallels or lines of communication.

**Method of Approaches**, in algebra, a process by trials, the results of which approach nearer and nearer to the truth. This is nearly similar to what is now called APPROXIMATION.

**APPROACHMENT** *s* The act of coming near (*Brown*)

**APPROBATION** *s* (*approbatio*, Latin) 1 The act of approving, or expressing himself pleased or satisfied (*Shakspeare*) 2 The liking of any thing (*South*) 3 Attestation, support (*Shakspeare*)

**APPROOF** *s* (from *approve*) Approbation, commendation (*Shakspeare*)

**TO APPROPINQUE** *v n* (*appropinquo*, Lat) To draw near to. not in use (*Hudib*)

**APPROPRIABLE** *a* (from *appropriate*) That it may be appropriated (*Brown*)

**TO APPROPRIATE** *v a* (*appropriare*, Fr) 1 To consign to some particular use or person (*Roscommon*) 2 To claim or exercise, to take to himself by an exclusive right (*Milton*) 3 To make peculiar, to annex (*Locke*) 4 (In law) To alienate a benefice (*Ayliffe*)

**APPROPRIATE** *a* (from the verb.) Peculiar, consigned to some particular use or person, belonging peculiarly (*Stirlingfleet*)

**APPROPRIATION** *s* (from *appropriate*) 1 The application of something to a particular purpose (*Locke*) 2 The claim of any thing as peculiar (*Shakspeare*) 3 The fixing a particular signification to a word (*Locke*)

**APPROPRIATION**, in canon law, the annexing of an ecclesiastical benefice to the proper and perpetual use of some religious house, bishopric, college, or spiritual person, to enjoy for ever, in the same way as impropriation is the annexing a benefice to the use of a lay person or corporation, that which is an appropriation in the hands of religious persons, being usually called an impropriation in the hands of the laity. It is computed that there are in England 3845 impropriations.

This contrivance seems to have sprung from the policy of monastic orders. At the first establishment of the parochial clergy, the tithes of the parish were distributed into four parts, one for the bishop, one to maintain the fabric of the church, a third for the poor, and a fourth for the incumbent. The sees of the bishops becoming amply endowed, their shares sunk into the others, and the monasteries inferring that a small part was enough for the officiating priests, appropriated as many benefices as they could by any means obtain, to their own use, undertaking to keep the church in repair, and to keep it constantly served. But, in order to complete such appropriation effectually, the king's licence and consent of the bishop must first be obtained, because they might both, some time or other, have an interest, by lapse, in the benefice, if it were not in the hands of a corporation which never dies. The consent of the patron also is necessarily implied, because the appropriation can be originally made to none but to such spiritual corporation as is also the patron of the church, the whole being indeed nothing else but an allowance for the patrons to retain the tithes and glebe in their own hands, without presenting any clerk, they themselves undertaking to provide for the service of the church. When the appropriation is thus made, the appropriators and their successors are perpetual parsons of the church, and must sue and be sued, in all matters concerning the rights of the church, by the name of parsons.

This appropriation may be severed, and the church become disappropriated, two ways, as, first, if the patron or appropriator present a clerk who is instituted and inducted to the parsonage, for such incumbent is to all intents and purposes a complete parson, and the appropriation being once severed can never be reunited, unless by a repetition of the same solemnities. And when the clerk so presented is distinct from the vicar, the rectory thus vested in him becomes what is called a sine-cure, because he hath no cure of souls, having a vicar under him to whom that cure is committed. Also, if the corporation which has the appropriation is dissolved, the parsonage becomes disappropriated at common law because the perpetuity of person is gone, which is necessary to support the appropriation.

In this manner and subject to these conditions, may appropriations be made at this day, and thus were most if not all of the appropriations at present existing originally made;

being annexed to bishoprics, prebends, religious houses, nay, even to nunneries, and certain military orders, all of which were spiritual corporations. At the dissolution of monasteries by statutes 27 Hen. VIII c 28 and 31 Hen VIII c 13 the appropriations of several parsonages, which belonged to those respective religious houses (amounting to more than one-third of all the parishes in England), would have been by the rules of the common law disappropriated. See the articles PARSON and VICAR.

**APPROPRIATOR** *s* (from *appropriate*) He that is possessed of an appropriated benefice (*Ayliffe*).

**APPROVABLE** *a* (from *approve*) That merits approbation (*Brown*).

**APPROVAL** *s* (from *approve*) Approbation (*Temple*).

**APPROVANCE** *s* (from *approve*) Approbation (*Thomson*).

To **APPROVE** *v a* (*approver*, French) 1 To like, to be pleased with (*Hooker*) 2 To express liking (*Locke*) 3 To prove, to show (*Millotson*) 4 To experience not in use (*Shakspeare*) 5 To make, or show, to be worthy of approbation (*Rogers*).

**APPROVEMENT** *s* (from *approve*) Approbation, liking (*Hayward*).

**APPROVER** *s* (from *approve*) 1 He that approves 2 He that makes trial (*Shakspeare*) 3 (In law) One that, confessing felony of himself, accuses another (*Cowell*).

**APPROVER**, in ancient law, a bailiff or land steward.

**APPROVERS** of the king, are those who have the letting of the king's demesnes in small manors.

**APPROXIMATE** *ad* (from *ad* and *proxima*) Near to (*Brown*).

**APPROXIMATING** *llavis* Growing very near each other. Opposed to remote. With reference to the stem, growing almost upright.

**APPROXIMATION**, in arithmetic, and algebra, the method of approaching still nearer to the quantity sought without a possibility of finding it exactly. Methods of continual approximation for the square, cube, and other roots of surd numbers, have been invented by various mathematicians from Lucas de Burgo down to the present time for some of these we refer to the articles **EXTRACTION** and **ROOT**.

**APPROXIMATION to the Roots of Equations** There have been various rules given for this purpose by different authors we insert a rule of sir Isaac Newton's as one of the most simple.

*Lemma* If any two numbers, being inserted for the unknown quantity in an equation, give results with opposite signs, an odd number of roots must be between these numbers.

This appears from the property of the absolute term, and from this obvious maxim, that if a number of quantities be multiplied together, and if the signs of an odd number of them be



changed, the sign of the product is changed. For, when a positive quantity is inserted for  $x$ , the result is the absolute term of an equation whose roots are less than the roots of the given equation by that quantity. If the result has the same sign as the given absolute term, then from the property of the absolute term either none, or an even number only, of the positive roots have had their signs changed by the transformation, but if the result has an opposite sign to that of the given absolute term, the signs of an odd number of the positive roots must have been changed. In the first case, then, the quantity substituted must have been either greater than each of an even number of the positive roots of the given equation, or less than any of them, in the second case it must have been greater than each of an odd number of the positive roots. An odd number of the positive roots, therefore, must lie between them when they give results with opposite signs. The same observation is to be extended to the substitution of negative quantities and the negative roots.

From this lemma, by means of trials, it will not be difficult to find the nearest integer to a root of a given numeral equation.

Let the equation be  $x^3 - 2x - 5 = 0$

1 In this case a root is between 2 and 3, for these numbers being inserted for  $x$ , the one gives a positive, and the other a negative, result. Either the number above the root, or that below it, may be assumed as the first value, only it will be more convenient to take that which appears to be nearest to the root.

2 Suppose  $x = 2 + f$ , and substitute this value of  $x$  in the equation

$$\begin{aligned} x^3 &= 8 + 12f + 6ff + f^3 \\ -2x &= -4 - 2f \\ -5 &= -5 \end{aligned}$$

$$x^3 - 2x - 5 = -1 + 10f + 6f^2 + f^3 = 0$$

If  $f$  is less than unit, its powers  $f^2$  and  $f^3$  may be neglected in this first approximation and  $10f = 1$ , or 0.1 nearly, therefore  $x = 2.1$  nearly.

3 As  $f = 0.1$  nearly, let  $f = 1 + g$ , and insert this value of  $f$  in the preceding equation

$$\begin{aligned} f^3 &= 0.001 + 0.03g + 0.3g^2 + g^3 \\ 6f^2 &= 0.06 + 1.2g + 6g^2 \\ 10f &= 1 + 10g \\ -1 &= -1 \end{aligned}$$

$f^3 + 6f^2 + 10f - 1 = 0.061 + 11.23g + 6.3g^2 + g^3 = 0$ , and neglecting  $g^2$  and  $g^3$  as very small,  $0.061 + 11.23g = 0$ , or  $g = \frac{-0.061}{11.23} = -0.0054$ , hence  $f = 0.1 + g = 0.0946$  nearly, and  $x = 2.0946$  nearly.

4 This operation may be continued to any length, as by supposing  $g = -0.004 + h$ , and so on, and the value of  $x = 2.09455147$  nearly.

By the first operation a nearer value of  $x$  may be found thus: since  $f = 1$  nearly, and  $-1$

$$+ 10f + 6f^2 + f^3 = 0, f = \frac{1}{10 + 6f + f^2}, \text{ that}$$

$$\text{is, } f = \frac{1}{10 + 6 + 01} = 0.04 \text{ true to the last figure, and } x = 2.094$$

in the same manner may the root of a pure

equation be found, and this gives an easy method of approximating to the roots of numbers which are not perfect powers.

This rule is applicable to numeral equations of every order, and, by assuming a general equation, general rules may be deduced for approximating to the roots of any proposed equation. By a similar method we may approximate to the roots of literal equations, which will be expressed by infinite series.

Other ingenious methods of approximation to the roots of equations, may be seen in Clairaut's Algebra, in Newton's, Simpson's, Bopnycastle's and Friend's, and in Hutton's Course of Mathematics. On this subject, too, the reader may consult J. Bernoulli, *Opusculum*, tome iii Taylor, in *Phil Trans* an 1717, Simpson's *Essays*, his *select Exercises*, and Lagrange in *Mem Acad Berlin*, an 1767. See also *EQUATIONS AND EXPEDIENT*.

APPUI, (French,) or stay upon the hand, is the reciprocal sense between the horse's mouth and the bridle hand, or in other words, the sense of the action of the bridle in the horseman's hand. The true and right appui of the hand, is the nice bearing or stay of the bridle, so that the horse is intimidated by the sensibility and tenderness of the parts of his mouth, from resting much upon the bit-mouth, or checking, or beating upon the hand to withstand it. Thus it is said such a horse has a dull appui, that is, has a good mouth, but his tongue is so thick and large, that the bit cannot work upon the bars, for the tongue not being so sensible or tender as the bars, it is soon hardened by the bit, and renders the appui not good. Sometimes the bit does not press the bars in the quick, from the grossness of the tongue or lips, or because your horse has a rest, or stay, that forces the hand, which shews that he has a bad mouth. A horse is said to have no appui or rest upon the hand, when through fear of the hand he will not suffer the bit to press or bear in any degree on the parts of his mouth, whence he does not easily obey the bridle. If you mean to give a horse that is taught a good appui, or a good rest upon the hand, you must often gallop him, and put him back, a long stretch gallop is likewise very proper for the same purpose, for in galloping he gives the rider an opportunity of bearing upon the hand.

A horse that throws himself too much on the bit, is, in the language of the manage, said to have too much appui. A full appui upon the hand, is a firm stay, without resting heavy, and without bearing on the hand. This last is a necessary qualification for horses intended for the army. A more than full appui, is when a horse requires some force to stop him, but yet he does not force the hand. This appui is good for such horsemen as depend upon the bridle instead of their thighs.

APPULSE, (*appulsus*, Lat.) The act of striking against any thing (*Holder*).

APPULSE, in astronomy, the actual contact of two luminaries, according to some authors, but others describe it as their near approach to

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each other, so as to be seen, for instance, with in the same telescope. The appulses of the planets to the fixed stars have always been very useful to astronomers, as serving to fix and determine the places of the former. The ancients, wanting an easy method of comparing the planets with the ecliptic, which is not visible, had scarce any other way of fixing their situations, but by observing their track among the fixed stars, and marking their appulses to some of those visible points. See *Hist Acad Scienc* for 1710, pa 417 and *Philos Trans* No 369, where Dr Halley has given a method of determining the places of the planets, by observing their near appulses to the fixed stars.

**APPURTENANCES**, in common law, signifies things corporeal and incorporeal that appertain to another thing as principal, as hamlets to a manor, and common of pasture and fishery. Things must agree in nature and quality to be appurtenant, as a turbary, or a seat in a church, to a house.

**APRICOTS**, in botany. See **PRUNUS**.

**APRIL**, the fourth month of the year, according to the common computation, but the second, according to that of the astronomers. It contains 30 days.—The word is derived from *aprilis*, of *aperio* I open, because the earth, in this month, begins to open her bosom for the production of vegetables.

**A PRIORI**, a kind of demonstration. See **DEMONSTRATION**.

**APRON** : 1 A cloth hung before, to keep the other dress clean (*Addison*). 2 A piece of lead which covers the touch hole of a great gun.

**APRON-MAN** : (from *apron* and *man*) A workman, an artificer (*Shakspeare*).

**APRONED** *a* (from *apron*) Wearing an apron (*Pope*).

**APSES**, in astronomy, are the two points in the orbits of planets, where they are at their greatest and least distance from the sun or the earth, the point at the greatest distance being called the higher apsis, and that at the nearest distance the lower apsis. And the two apses are also called auges. Also the higher apsis is more particularly called the aphelion, or the apogee, and the lower apsis, the perihelion, or the perigee. The diameter which joins these two points is called the line of the apses or of the apsidæ, and it passes through the centre of the orbit of the planet, and the centre of the sun or the earth, and in the modern astronomy this line makes the longer or transverse axis of the elliptical orbit of the planet. In this line is counted the excentricity of the orbit, being the distance between the centre of the orbit and the focus, where is placed the sun or the earth.

The foregoing definitions suppose the lines of the greatest and least distances to lie in the same straight line, which is not always precisely the case; as they are sometimes out of a right line, making an angle greater or less than 180 degrees, and the difference from 180 degrees is called the motion of the line of the apses, when the angle is less than 180 degrees,

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the motion of the apses is said to be contrary to the order of the sign is, on the other hand, when the angle exceeds 180 degrees, the motion is according to the order of the signs. See **APHELION**.

**APSIS**, or **ABSIS**, signifies the bowed or arched roof of a house, room, or oven, &c. as also the ring or compass of a wheel.

**APSTIS**, in ecclesiastical writers, denotes an inner part in the ancient churches, wherein the clergy sat, and where the altar was placed.

The same word is used for the bishop's throne, in ancient churches likewise for a case in which the relics of saints are kept.

**APT**, a town of France, and principal place of a district, in the department of the Mouths of the Rhone, before the revolution, the see of a bishop, suffragan of Aix. The cathedral is said to be one of the oldest in France, and a council was held here in 136. It is situated on the river Calavon nine leagues L. Avignon, and seven N. Aix. Long 29 4 E. Ferro Lat 43 52 N.

**APT** *a* (*aptus*, Latin) 1 Fit (*Hooker*). 2 Having a tendency to (*Hooker*). 3 Inclined to; led to (*Bentley*). 4 Ready, quick (*Shakspeare*). 5 Qualified for (*Sidney*).

**To APT** *v a* (*aptus*, Latin) 1 To suit, to adapt (*Ben Jonson*). 2 To fit, to qualify (*Denham*).

**To APTATE** *v a* (*aptatum*, Latin) To make fit (*Barley*).

**APTINODYTES** Penguin. A genus of the class and order aves. Anseris. Bill straight a little compressed and sharp edged, the upper mandible longitudinally obliquely grooved, the lower truncate at the tip, tongue with reflected prickles, wings fin-shaped, without quill feathers, feet fettered, four-toed. Eleven species. This genus much resembles the auk in colour, food, stupidity, eggs, nest, position of the legs behind the equilibrium, and consequent erect posture, they are totally unfit for flight but swim dexterously, nostrils linear hid in the groove of the bill, palate, as well as the tongue, beset with a few rows of conic retroflected stiff papillæ, wings covered with strong, broad membrane, tail short, wedged the feathers very rigid. They are chiefly inhabitants of Falkland islands, and the shores of the Southern ocean.

**APTERA** Wingless insects. An order of the Linnæan class insectæ characterised, by the term aptera expresses, by having no wings in either sex. See **ZOOLOGY**.

**APTHANE**, a title formerly given to the chief Scotch nobility.

**APTITUDE** : (French) 1 Fitness (*Decay of Piety*). 2 Tendency (*Decay of Piety*). 3 Disposition (*Locke*).

**APPLY** *ad* (from *apt*) 1 Properly, fitly (*Blackmore*). 2 Justly, pertinently (*Addison*). 3 Readily, acutely: as, he learned his business very aptly.

**APTNESS** : (from *apt*) 1 Fitness, suitability (*Norris*). 2 Disposition to anything (*Shakspeare*). 3 Quickness of apprehension (*Bacon*). 4 Tendency (*Addison*).

## A Q U

**APTOTE** (of *a* and *where*) A noun which is not declined with cases

**APULEIUS**, a learned man who studied at Carthage, Athens, and Rome, where he married a rich widow, for which he was accused of using magical arts to win her heart. His apology was a masterly composition. He learnt Latin without a master. The most famous of his works extant is the Golden Ass, in eleven books, an allegorical piece replete with morality. Apuleius was born at Madaura, a Roman colony in Africa, and lived in the second century under the Antonines.

**APUS**, **AVIS INDICA**, in astronomy, a constellation of the southern hemisphere placed near the pole, between the triangulum australe and the chameleon, supposed to represent the bird of paradise. It contains 11 stars of the first six magnitudes, namely 0 0 0 4 3 4.

**APYCN**, in music, the collective name given by the ancient Greeks to those three sounds in their scale or system, which separately were called proslambromenos, nete symmenon, and nete hyperbolon.

**APYRXIA** (*apyxia, απρηξια*, from *a* priv. and *ρρηξια*, *a fever*) **APYREXY** Without fever. The intermission of feverish heat.

**APYROI**, in antiquity, altars whereon sacrifices were offered without fire.

**APYROUS**, a term formerly used to denote that property in some bodies by which they resist the most violent fire, without suffering any sensible change, but as it is probable that there are no bodies which are strictly and essentially apyrous, it is now become merely a relative term.

**AQUA** The origin of this word has strangely puzzled our lexicographers. *Aqua vivimus*, is the ridiculous derivation of Festus. *Aqua*, from its smooth surface, that of *Virro*. Scalliger travels farther, but with no better success, and derives it from an old Greek word *αχα*, equivalent to the Latin *aqua*, and equally explanatory. The radical may be found in most oriental languages. *aq* (aq), in Chaldean implies *a flux or tide*, whence probably the Greek *αqua* and *αqua*, *to come* *αqua* (αγα or aqua), in Heb. *to be boisterous*, *to murmur* or *roar*, *to carry off with vehemence*, *ideas* all appertaining to the waves of the sea. See **WATER**.

**AQUA ALUMINIS COMPOSITA** *Aqua aluminosa bateana*. This preparation is employed externally as a detergent. It forms a useful collyrium if properly diluted, and is an excellent injection for the cure of leucorrhœa.

**AQUA AMMONIÆ** *Spiritus salis ammoniaci*. This preparation is called *carbonas ammoniacæ liquidus* in the new chemical nomenclature. Similar to this in composition and virtues is the liquor volatilis cornu cervi. They are highly esteemed for their stimulating, nervine, antacid virtues, and are administered in debility, typhus, ataxia, atonic spasms, paralysis, syncope, postagra, rheumatism, &c. They are also employed externally with fixed oils, in paralysis, indolent tumours, and internal inflammations.

**AQUA AMMO'NIÆ ACETATÆ** *Acetis*

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*ammoniacalis* **Spiritus Mandereri**. This preparation is called *acetis ammoniacæ liquidus* in the new chemical nomenclature, it being a neutral salt in solution, formed by the combination of acetic acid with ammoniac. It is much esteemed as possessing nervine, diaphoretic, diuretic, and deobstruent virtues.

**AQUA AMMO'NIÆ PURÆ** *Spiritus salis ammoniaci cum calce*. Water saturated with ammoniacal gas. It is much used to smell at in faintings, &c. and possesses the same properties as ammoniacal gas. See **AMMONIAC**.

**AQUA ANETHI** *Aqua seminum anethi*. For the virtues of this distilled water, see **ANETHUM**.

**AQUA CALCEIS** *Lime water*. It is given internally in cardiacgia, spasms, diarrhœa, and convulsions of children, arising from acidity or ulcerated intestines, intermittent fevers, &c. Externally it is applied to burns and ulcers.

**AQUA CINNAMOMI** *Aqua cinnamomi simplex*. Distilled cinnamon water. For its virtues, see **CINNAMOMUM**.

**AQUA CÆLESTIS**, or **AQUA SAPPHIRINA**, a beautiful blue solution, formed by precipitating copper from its sulphate, or copperas, by the addition of liquid ammonia, and which precipitation is dissolved almost as soon as formed.

**AQUA CUPRI AMMONIATI** *Aqua saphirina*. This preparation is employed by surgeons to stimulate and clear foul ulcers.

**AQUA CUPRI VITRIOLATICOPOSITA**. This preparation of the Edinburgh Pharmacopœia is used externally to stop hæmorrhages of the nose.

**AQUA DISTILLATA** See **WATER**.

**AQUA FENICULI** For the virtues of distilled fennel water, see **FENICULUM**.

**AQUA FORTIS** See **ACIDUM NITROSUM DILUTUM**.

\* **AQUA KALI** *Oleum tartari per deliquium* **LIXIVUM tartari**. This is the liquid carbonate of potash, *carbonas potassa liquidus*. It possesses antacid virtues, and is a good antidote against arsenic taken into the stomach. It is also given with advantage in convulsions and spasms, from acidity in the stomach of children, in calculous diseases, gouty affections, scrophula, aphthæ, &c. The carbonate of soda is milder, and perhaps a preferable remedy for general use. See **CARBONAS SODÆ**.

**AQUA KALI PURI** *Lixivium saponarium*. This possesses diuretic and lithontriptic virtues, enveloped in weak broths or mucilaginous drinks. Diluted in tepid water, in the proportion of three drops to two ounces, it serves as an efficacious detergent in xerophthalmia.

**AQUA LITHARGYRI ACETATI** *Acetum lithargyri* *Extractum saturni*. This is the celebrated extract of Goulard. It is called *acetis plumbi liquidus* in the new chemical nomenclature. It is principally employed by surgeons in the aqua lithargyri acetati composita, &c. externally, as a resolvent against inflammatory affections.

**AQUA LITHARGYRI ACETATI COMPOSITA** *Aqua vegeto mineralis*, Goulard's ve-

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**geto-mineral water** The virtues of this water are resolvent, refrigerant, and sedative

**AQUA MARINA** See **GEMMA**

**AQUA MENTHÆ PIPERITIDIS** See **MENTHA PIPERITIS**

**AQUA MENTHÆ SATIVÆ** Aqua menthæ vulgaris simplex See **MENTHA SATIVA**

**AQUA PIMENTO** Aqua piperitidis Jamaicaensis For the virtues of this distilled water, see **PIMENTO**

**AQUA PULEGII** Aqua pulegi simplex For its virtues, see **PULEGIUM**

**AQUA REGIA**, or **AQUA REGALIS**, a mixture of nitrous and muriatic acids in different proportions, so called formerly on account of its being then the only acid known capable of dissolving gold Its modern name is nitromuriatic acid

**AQUA ROSÆ** Aqua rosarum damascenarum Distilled rose water is employed only as a pleasant vehicle for other medicines, collyria, &c

**AQUA SULPHURATA**, the gas sulphuris of Van Helmont, is the liquid sulphureous acid

**AQUA VITÆ**, or **WATER OF LIFE**, is a name familiarly applied to native distilled spirits, somewhat corresponding to brandy when obtained from grape wine, and malt spirits when procured from that substance Of the first kind are the eau de vie of the French, and of the second the usquebaugh of the Irish, and the whisky of the Scotch

**AQUA ZINCI VITRIOLATI CUM CAMPHORA** Aquæ vitriolica camphorata This, when properly diluted, is an useful collyrium for inflammation of the eyes, in which there is a weakness of the parts Externally it is applied by surgeons to scorbutic and phagedenic ulcerations

**AQUÆ MINERALES** See **WATERS**, **MINERAL**

**AQUÆDUCT**, **AQUÆDUCTUS**, q d ductus aque, a conduit of water, is a construction of stone or timber, built on an uneven ground, to preserve the level of water, and convey it, by a canal, from one place to another There are aqueducts under ground, and others raised above it, supported by arches The Roman were very magnificent in their aqueducts, they had some that extended an hundred miles Frontinus, a man of consular dignity, and who had the direction of the aqueducts under the emperor Nerva, tells us of nine that emptied themselves through 13,594 pipes of an inch diameter Vigenere has observed, that, in the space of twenty-four hours, Rome received from these aqueducts no less than five hundred thousand hogsheads of water The three chief aqueducts now in being are those of the Aqua Virginea, Aqua Felice, and Aqua Paulina

**AQUÆDUCT OF FALLOPIUS** A canal in the petrous portion of the temporal bone, first accurately described by Fallopius

**AQUÆMANILIS** (from *aqua*, water, and *manus*, hand) In ecclesiastical writers, a kind of basin or laver, anciently placed in the vestibule of churches, to wash the hands in

**AQUAMBOU** See **ACAMBOU**

## A Q U

**AQUARIANS**, Christians in the primitive church who consecrated water in the eucharist instead of wine, under pretence of abstinence and temperance

**AQUARIUS**, in astronomy, one of the celestial constellations, being the eleventh sign in the zodiac, reckoning from Aries, and is marked by the character ♒, representing part of a stream of water, issuing from the vessel of Aquarius, or the water-pourer This sign also gives name to the eleventh part of the ecliptic, through which the sun moves in part of the months of January and February The stars in this constellation are commonly estimated at 58 of the first six magnitudes, 1 e 0 0 2 5 9 42

**AQUARTIA** In botany, a genus of the class and order tetrandria monogynia Cilyx campanulate, corol wheel-shaped, with linear segments, berry many-seeded Two species natives of South America

**AQUATIA**, in middle age writers, a right of fishing three days in a year

**AQUATICA NUX** See **TRIBULUS AQUATICUS**

**AQUATICK** a (*aquaticus* Latin) 1 That inhabits the water (*Hay*) 2 That grows in the water (*Mortimer*)

**AQUATICUM**, in middle age writers, a right to use water

**AQUATILIE** a (*aquatilis*, Latin) That inhabits the water (*Brown*)

**AQUATINTA**, a method of etching on copper, lately invented, and by which a soft and beautiful effect is produced, resembling a fine drawing in water colours or Indian ink Aquatinta engraving is a particular method of corroding a copper plate with aqua fortis The best description of the process we have seen, is the following, given in Dr REISS NEW Cyclo-pædia

The work is effected by covering the copper with a powder or some substance which takes a granulated form, so as to prevent the aqua-fortis from acting where the particles adhere, and by this means cause it to corrode the copper partially, and in the interstices only When these particles are extremely minute, and near to each other, the impression from the plate appears to the naked eye exactly like a wash of Indian ink But when they are larger, the granulation is more distinct, and as this may be varied at pleasure, it is capable of being adapted with great success to a variety of purposes and subjects

This powder or granulation is called the aquatinta grain, and there are two general modes of producing it

We shall first describe what is called the powder grain, because it was the first that was used Having etched the outline on a copper-plate prepared in the usual way by the copper-smith (for which see the article **ETCHING**), some substance must be finely powdered and sifted which will melt with heat, and when cold adhere to the plate, and resist the action of aqua fortis The substances which have been used for this purpose, either separately or

## A Q U A T I N T A

mixed, are asphaltum, Burgundy pitch, resin, gum-copal, and gum-mastic, and, in a greater or less degree, all the resins and gum-resins will answer the purpose. Common resin has been most generally used, and answers tolerably well, though gum-copal makes a grain that resists the aqua fortis better. The substance intended to be used for the grain must now be distributed over the plate is equally as possible, and different methods of performing this essential part of the operation have been used by different engravers, and at different times. The most usual way is to tie up some of the powder in a piece of muslin, and to strike it against a piece of stick held at a considerable height above the plate. By this, the powder that issues falls gently, and settles equally over the plate. Every one must have observed how uniformly hair-powder settles upon the furniture after the operations of the hair-dresser: this may afford a hint towards the best mode of performing this part of the process. The powder must fall upon it from a considerable height, and there must be a sufficiently large cloud of dust formed. The plate being covered equally over with the dust or powder, the operator is next to proceed to fix it upon the plate, by heating it gently, so as to melt the particles. This may be effected by holding under the plate lighted pieces of brown paper rolled up, and moving them about till every part of the powder is melted. This will be known by its change of colour, which will turn brownish. It must now be suffered to cool, when it may be examined with a magnifier, and if the grains or particles appear to be uniformly distributed, it is ready for the next part of the process.

The design or drawing to be engraved must now be examined, and such parts of it as are perfectly white are to be remarked. Those corresponding parts of the plate must be covered, or stopped out, as it is called, with turpentine, or what is better, a sticky varnish, diluted with turpentine to a proper consistence to work freely with the pencil, and mixed with lamp-black to give it colour, for, if transparent, the touches of the pencil would not be so distinctly seen. The margin of the plate must also be covered with varnish. When the stopping out is sufficiently dry, a border of wax must be raised round the plate in the same manner as in etching, and the aqua-fortis, properly diluted with water, poured on. This is called biting in, and it is that part of the process which is most uncertain, and which requires the greatest degree of experience. When the aqua-fortis has lain on so long that the plate, when printed, would produce the lightest tint in the drawing, it is poured off, and the plate washed with water, and dried. When it is quite dry, the lightest tints are stopped out, and the aqua-fortis poured on as before, and this is repeated as often as there are tints to be produced in the plate.

Although many plates are etched entirely by this method of stopping out and biting in alter-

nately, yet it may be easily conceived that in general it would be very difficult to stop round and leave out all the finishing touches, as also the leaves of trees, and many other objects, which it would be impossible to execute with the necessary degree of freedom in this manner.

To overcome this difficulty, another very ingenious process has been invented, by which the touches are laid on the plate with the same ease and expedition as they are in a drawing in Indian ink. Fine washed whiting is mixed with a little treacle or sugar, and diluted with water in the pencil, so as to work freely, and this is laid on the plate covered with the aquatint ground, in the same manner and on the same parts as ink on the drawing. When this is dry, the whole plate is varnished over with a weak and thin varnish of turpentine, asphaltum, or mastic, and then suffered to dry, when the aqua fortis is poured on. The varnish will immediately break up in the parts where the treacle mixture was laid, and expose all those places to the action of the acid, while the rest of the plate remains secure. The effect of this will be, that all the touches, or places where the treacle was used, will be bit in deeper than the rest, and will have all the precision of touches in Indian ink.

After the plate is completely bit in, the bordering wax is taken off by heating the plate a little with a lighted piece of paper, and it is then cleared from the ground and varnish by oil of turpentine, and wiped clean with a rag and a little fine whiting, and then it is ready for the printer.

The principal disadvantages of this method of aquatinting are, that it is extremely difficult to produce the required degree of coarseness or fineness in the grain, and that plates so engraved do not print many impressions without wearing out. It is therefore now very seldom used, though it is occasionally of service.

We next proceed to describe the second method of producing the aquatint ground, which is generally adopted. Some resinous substance is dissolved in spirits of wine, as for instance common resin, Burgundy pitch, or mastic, and this solution is poured all over the plate, which is then held in a slanting direction till all the superfluous fluid drains off, and it is then laid down to dry, which it does in a few minutes. If the plate be then examined with the magnifier, it will be found that the spirit in evaporating has left the resin in a granulated state, or rather, that the latter has cracked in every possible direction, still adhering firmly to the copper. A grain is thus produced with the greatest ease, which is extremely regular and beautiful, and much superior for most purposes to that produced by the other method. After the grain is formed, every part of the process is conducted in the same manner as above described.

Having thus given a general idea of the art, we shall mention some particulars necessary to be attended to, in order to ensure success in the operation. The spirits of wine must be

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rectified, and of the best quality what is sold in the shops contains camphor, which would entirely spoil the grain

Resin, Burgundy pitch, and gum-mastic, when dissolved in spirits of wine, produce grains of a different appearance and figure, and are sometimes used separately and sometimes mixed in different proportions, according to the taste of the artist, some using one substance and some another

In order to produce a coarse or fine grain, it is necessary to use a greater or smaller quantity of resin, and to ascertain the proper proportions, several spare pieces of copper must be provided, on which the liquid may be poured, and the grain examined before it is applied to the plate to be engraved

After the solution is made, it must stand still and undisturbed for a day or two, till all the impurities of the resin have settled to the bottom, and the fluid is perfectly pellucid No other method of freeing it from those impurities has been found to answer Straining it through linen or muslin fills it with hairs, which are ruinous to the grain

The room in which the liquid is poured on the plate must be perfectly still, and free from dust, which, whenever it falls on the plate while wet, causes the grain to form a white spot, which it is impossible to remove without laying the grain afresh

The plate must be previously cleaned, with the greatest possible care, with a rag and whiting, as the smallest stain or particle of grease produces a streak or blemish in the grain

All these attentions are absolutely necessary to produce a tolerable regular grain, and, after every thing that can be done by the most experienced artists, still there is much uncertainty in the process They are sometimes obliged to lay on the grain several times before they procure one sufficiently regular The same proportions of materials do not always produce the same effect, as it depends in some degree upon their qualities, and is even materially affected by the weather These difficulties are not to be surmounted but by a great deal of experience, and those who are daily in the habit of practising the art are frequently liable to the most unaccountable accidents Indeed it is much to be lamented, that so elegant and useful a process should be so delicate and uncertain

It being necessary to hold the plate in a slanting direction in order to drain off the superfluous fluid, there will naturally be a greater body of the liquid at the bottom than at the top of the plate On this account, a grain laid in this way is always coarser at that side of the plate that was held lowermost The most usual way is, to keep the coarsest side for the foreground, being generally the part that has the deepest shadows In large landscapes, sometimes various parts are laid with different grains, according to the nature of the subject

The finer the grain is, the more nearly does the impression resemble Indian ink, and the

fitter it is for imitating drawings But very fine grains have several disadvantages for they are apt to come off before the aqua fortis has lain on long enough to produce the desired depth, and as the plate is not corroded so deep, it sooner wears out in printing whereas coarser grains are firmer, the acid goes deeper, and the plate will throw off a great many more impressions The reason of all this is evident, when it is considered, that in the fine grains the particles are small and near to each other, and consequently the aquafortis, which acts laterally as well as downwards, soon undermines the particles and causes them to come off If left too long on the plate, the acid would eat away the grain entirely

On these accounts, therefore, the moderately coarse grains are more sought after, and answer better the purpose of the publisher, than the fine grains which were formerly in use

Although there are considerable difficulties in laying properly the aquatint grain, yet the corroding the copper, or biting in, so as to produce exactly the tint required, is still more precarious and uncertain All engravers allow that no positive rules can be laid down by which the success of the process can be secured, nothing but a great deal of experience and attentive observation can enable the artist to do it with any degree of certainty

There are some hints, however, which may be of considerable importance to the person who wishes to attain the practice of this art

It is evident, that the longer the acid remains on the copper, the deeper it bites, and consequently the darker will be the shade in the impression It may be of some use, therefore, to have several bits of copper laid with aquatint ground of the same kind that is to be used in the plate, and to let the aquafortis remain for different lengths of time on each, and then to examine the tints produced in one, two, three, four minutes, or longer Observations of this kind frequently repeated, and with different degrees of strength of the acid, will at length assist the judgment in guessing at the tint which is produced in the plate A magnifier is also useful to examine the grain, and to observe the depth to which it is bit It must be observed that no proof of the plate can be obtained till the whole process is finished

If any part appears to have been bit too dark, it must be burnished down with a steel burnisher, and this requires great delicacy and good management, not to make the shade streaky, and the beauty and durability of the grain is always somewhat injured by it, so that it should be avoided as much as possible

Those parts which are not dark enough must have a fresh grain laid over them, and be stopped round with varnish and subjected again to the aquafortis This is called re-biting, and requires peculiar care and attention The plate must be very well cleaned out with turpentine before the grain is laid on, which should be pretty coarse, otherwise it will not lie upon the heights only, as is necessary in order to pro-

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duce the same grain If the new grain is different from the former, it will not be so clear, nor so firm, but rotten

We have now given a general account of the process of engraving in aquatinta, and we believe that no material circumstance has been omitted that can be communicated without seeing the operation But after all, it must be confessed that no printed directions whatever can enable a person to practise it Its success depends upon so many niceties, and attention to circumstances apparently trifling, that the person who attempts it must not be surprised if he does not succeed at first It is a species of engraving simple and expeditious, if every thing goes on well, but it is very precarious, and the errors which are made are rectified with great difficulty

It seems to be adapted chiefly for imitations of sketches, washed drawings, and slight subjects, but does not appear to be at all calculated to produce prints from finished pictures, as it is not susceptible of that accuracy in the balance of tints necessary for this purpose Nor does it appear to be suited for book plates, as it does not throw off a sufficient number of impressions It is therefore not to be put into competition with the other modes of engraving It confined to those subjects for which it is calculated, it must be allowed to be extremely useful, as it is expeditious, and may be attained with much less difficulty than any other mode of engraving But even this circumstance is a source of mischief, as it occasions the production of a multitude of prints that have no other effect than that of vitiating the public taste

In the art before described, the artists experience much inconvenience from the quantity of fumes liberated by the action of the acid upon the copper, which, when the plate is large, is very great To remedy this inconvenience, the following arrangement, which we think well calculated to answer the purpose has been suggested by Mr Cornelius Varley, a young artist who distinguishes himself no less by his mechanical abilities than by the exquisite productions of his pencil in water colours —Get a frame made of common deal or any kind of wood, three or four inches deep, covered with a plate of glass, and open at one side, and let the side opposite to this have a round opening communicating, by means of common iron pipe, with the ash-pit of any little stove or other fire-place, shut up from all other access of air but what must pass through the pipe It is obvious that any fumes rising from a copper-plate laid under such a frame will be carried backward into the iron pipe by the current of air required to maintain combustion in the stove, and will by this means be carried up the chimney in place of being allowed to fly about in the apartment The pipe may be very conveniently used by carrying it down through the table to the floor, and so along to the place where the chimney may chance to stand, and when the frame is not wanted, the pipe at one of the joinings may be made to answer the purpose of a hinge by which to

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turn up the frame against the wall, where it may be secured, while out of use, by a button or any other contrivance Phil Mag No 90

**AQUEDUCT** See **AQUEDUCT**

**AQUEOUS** *a* Partaking of the nature of water, or that abounds with it

**AQUEOUS FUSION**, in chemistry, is the solution of any substance in warm water, and is only effectual when employed upon saline matters, which it dissolves by entering into the constitution of their crystals This mode of fusion is distinguished from that in which fire is employed to melt a substance, and which is therefore called igneous fusion

**AQUEOUS HUMOUR OF THE EYE**, **Humor aqueus** The very limpid watery fluid which fills both chambers of the eye

**AQUEOUSNESS** *s* (*aquositas*, Lat) Watrishness

**AQUIFOLIUM**, (*aquifolium*, from *acus*, a needle, and *folium*, a leaf, so called on account of its prickly leaf) Holly The leaves of this plant, *Ilex aquifolium*, *foliis ovatis acutis spinosis* of Linneus, have been known to cure intermittent fevers, and an infusion of the leaves, drank as tea, is said to be a preventive against the gout

**AQUILA**, a large handsome town of Naples, in Italy It is the see of a bishop and has a strong castle By an earthquake which happened here in 1700, 2,400 persons were destroyed, and 1,500 otherwise hurt Lat 42 20 N Lon 13 39 E

**AQUILA**, the Eagle, or the Vulture as it is sometimes called, is a constellation of the northern hemisphere, usually joined with Antinous It is one of the 48 old constellations, according to the division of which Hipparchus made his catalogue of the fixed stars, and which are described by Ptolemy The number of stars in Aquila are estimated at 29, of the first six magnitudes, in this order, 1 0 5 1 4 18 besides the 34 in Antinous

**AQUILA ALBA** One of the names given to calomel See **CALOMELAS**

**AQUILARIA** Eagle-wood a genus of the class and order decandria, monogynia Calyx campanulate, five-cleft, corollless, nectary campanulate, five cleft, bearing the stamens internally, capsule two-valved, two-celled, woody, seeds solitary The only known species is a Malacca-tree, from whose bark the Cochun-chinese manufacture paper

**AQUILEGIA** Columbine a genus of the class and order polyandria, pentagynia Calyx- less, petals five, nectaries five, horned, one between each petal, capsules five, distinct Five species, south of Europe, Canada, Siberia The plant is thus denominated from *aqua*, water, and *lego*, to gather, from the shape of its leaves, which retain water The seeds, flowers, and the whole plant, of the species *aquilegia vulgaris*, *nectarius incurvis* of Linneus, have been used medicinally, the first in exanthematic diseases, the latter chiefly as an antiscorbutic Though retained in several foreign pharmacopoeias, their utility appears to be forgotten in this country



**AQUILEIA**, in ancient geography, an ancient and large city of Italy, situate on the seacoast at the entrance of the Sinus Tergestinus, or gulf of Trieste

**AQUILICUM**, in Roman antiquity, a sacrifice offered in time of drought, to obtain rain

**AQUILINE** *a* (*aquilinus*, Latin) Resembling an eagle, when applied to the nose, hooked (*Dryden*)

**AQUILO**, is used by Vitruvius for the north-east wind, or that which blows at 45° from the north toward the east point of the horizon — The poets gave the name aquilo to all stormy winds dreaded by the manner

**AQUILUS**, among the ancients, a dark colour approaching nearly to black

**AQUIMINARIUM**, a vessel wherein the Romans carried holy water

**AQUINAS** (St Thomas), called the Angelical Doctor, of the noble family of Aquino, and descended from the kings of Sicily and Arragon, was born in the castle of Aquino, in Italy, about 1224 He entered into the society of the preaching friars at Naples, much against the inclination of his parents, who endeavoured to recover him, but in vain In 1244 he went to Paris, and from thence to Cologne, where he attended the lectures of Albertus Magnus He afterwards returned to Paris, and read lectures on the book of sentences with applause In 1255, he was created D D and about 1263 went to Rome, and after teaching divinity in various universities, he settled at Naples, and obtained a pension from the king Here he devoted himself to study and religious exercises, and refused the archbishopric of Naples, which was offered him by pope Clement IV In 1274, he was sent for to assist at the second council of Lyons, but died on the journey, at the monastery of Fossanova, near Terracina, aged 50 The authority of Aquinas has always been very high in the Roman church He was canonized by pope John XXII in 1323 His works, making 17 vols folio, have been printed several times, and at several places

**AQUINO**, a town of Naples, in Italy It is a bishop's see, but being almost ruined, consists now of about 30 houses This was the birth-place of Juvenal, the celebrated Roman satyrst, and Thomas Aquinas, the famous school-man Lat 41 36 N Lon 13 30 E

**AQUOSE** *a* (from *agua*, Lat) Watery, having the qualities of water

**AQUOSITY** *s* (from *aquose*) Wateriness

**AQUULA**, (*aquila*, dim of *agua*) A small quantity of very fine and limpid water, thus it is applied to the pellucid water, which depends the capsule of the crystalline lens, and the lens itself

*A R. anno regni*, that is, in the year of the reign

**ARA THURIBULI**, the Altar of incense, in astronomy, a southern constellation, not visible in our hemisphere, consisting of 9 stars named thus: 0 0 1 6 1 1

**ARABESQUE**, or **ARABESK**, something done after the manner of the Arabians

**ARABESQUE**, **GROTESQUE**, and **MOROSQUE**, are terms applied to such paintings, or ornaments of freezes, &c wherein there are no human or animal figures, but which consist wholly of imaginary foliages, plants, stalks, &c.

**ARABIA**, one of the most considerable countries of Asia, is bounded on the west by the Red Sea, the isthmus of Suez, Palestine, and Syria, on the north by the Euphrates, on the east by the gulf of Persia and the sea, and on the south by the straits of Babelmel and the sea Europeans have divided it into three parts, named from their supposed qualities, Arabia Deserta, Arabia Petraea, and Arabia Felix Arabia extends from lat 12 30 to 31 30 N and from lon 52 to 77 E Ferro, about 1350 miles from N to S and 1620 from E to W In some provinces of Arabia, the heat is excessive, but in this country, as in most others, the varying degrees of elevation, the relative situations of places, and the nature of the soil, occasion considerable varieties of temperature In the deserts, diversified here and there only by bare rocks, and in these flat plains, there is nothing to soften the force of the sun's rays, but all vegetables are burnt up, and the soil is every where reduced to sand In the interior country the temperature of the atmosphere is very different The greater ranges of lofty mountains attract vapours, and these falling down in plentiful rains, cool the air and quicken vegetation The cold occasioned by the height of the country produces falls of snow, but this never lies long upon the ground The rainy seasons which are regular in the countries between the tropics, are diversified here

The product of Arabia is aloes, cassia spike nard, frankincense, myrrh, minna, and other valuable gums, cinnamon, pepper, cardamom dates, oranges, lemons, pomegranates fig and other fruits, honey and wax in plenty and in their seas, they have great quantities of the best coral and pearls In Arabia, is abundance of all the domestic animals common in hot countries

Of all their domestic animals, it is well known that the Arabians put the greatest value on their horses Of these they have two great branches, the Kaduschi, whose descent is unknown, and the Kochlam, of which a written genealogy has been kept for two thousand years The Kaduschi are in no better estimation than our European horses, and are usually employed in bearing burthens, and in ordinary labour The Kochlam are reserved for riding solely They are highly esteemed, and consequently very dear They are said to have derived their origin from king Solomon's studs however this may be, they are fit to bear the greatest fatigues, and can pass whole days without food They are also said to show uncommon courage against an enemy it is even asserted, that when a horse of this race finds himself wounded, and unable to bear his rider much longer, he retires from the fray, and conveys him to a place of security If the rider falls upon the ground, this horse

\* remains beside him, and awaits till assistance is brought

**ARABIA DESERTA**, now called **BERII ARBISTAN**, and **BERIARA**, is bounded on the east by Diarbekir and the Persian province of Irak, on the north by Syria and the river Euphrates, on the west by Palestine and Arabia Petraea, and on the south by Arabia Felix. This country is for the most part desert, being intersected almost every where by high barren mountains, and many of its plains nothing but great sands and heaths, through some of which neither men, beasts, birds, trees, grass, or pasture, are to be seen, the lands, however, that lie to the east along the river Euphrates, afford both plants and food for the inhabitants of some cities and towns seated on that part, and there are some plains and valleys that feed great numbers of sheep, goats, and other small cattle, which love to browse upon such dry lands, but larger cattle, except camels, can find here no subsistence. The method of the inhabitants of the desert is to seek after fresh pastures near rivers, lakes, or other places where they can find water for themselves and cattle, and when they have cleared the ground, to look out for another

**ARABIA PETRAEA**, or the **STONY**, the most western of all the Arabias, is bounded on the north by Palestine, on the east by Arabia Deserta and part of Arabia Felix, on the south by Arabia Felix, and on the west by the Red Sea and the isthmus of Suez, its extent from north to south computed to be 180 miles, and from east to west 150. It is called Petraea, or Stony, from its rocks, though some rather derive it from Petra, its ancient capital, now commonly supposed to be Harach, or Horac, lying on the isthmus, near the frontiers of Egypt. Though, in most respects, it much resembles Arabia Deserta for its stony, sandy, and barren ground, yet it yields, in some parts, sufficient nourishment for cattle, whose milk and curdled flesh is the chief food of its inhabitants. There are some other parts which are quite uninhabited and impassable.

**ARABIA FELIX**, or **THE HAPPY**, by far the most considerable of the three, is called by the inhabitants Yeman, or Yaman, it was called Felix, or Happy, according to Ammianus Marcellinus, because it abounded in corn, cattle, vines, and odoriferous spices of all kinds. It was also called Sacred, on account of the fine gums and aromatic woods employed in sacrifices, which it produced — Felix, or Happy, is, according to Niebuhr, a title unknown to the Arabians, who divide the country into six provinces, namely, viz. Hedjas, Yemen, Hadramaut, Oman, Lachsa, or Hadjar, and Nedsjd, the principal cities are Mecca, Medina, Mocha, Loheia, &c.

**ARABIC GUM**, (*gummi arabicum*, so called from its being brought from Arabia.) This gum exudes, in a liquid state, from the bark of the trunk of the *Mimosa nilotica* of Linnæus, (*mimosa*, sprais stipularibus patentibus, iolus bipinnatis partialibus extimis glandula interunctis, spicis globosis pedunculatis,) in a

similar manner to the gum which is found upon the cherry trees in this country. That or a pale yellowish colour is most esteemed. Gum arabic is neither soluble in spirit nor in oil, but in twice its weight of water it dissolves into a mucilaginous fluid, of the consistence of a thick syrup, and in this state answers many useful pharmacæutic purposes, by rendering oily, resinous, and pinguous substances miscible with water. The glutinous quality of gum arabic renders it preferable to other gums and mucilages as a demulcent in coughs, hoarsenesses, and other catarrhal affections. It is also very generally employed in arid urine, diarrhoeas, and calculous complaints.

**ARABICI**, a sect who sprung up in Arabia about the year 207, whose distinguishing tenet was, that the soul died with the body, and also rose again with it. Eusebius, lib vi c 38, relates, that a council was called to stop the progress of this rising sect and that Origen resisted at it, and convinced them so thoroughly of their error that they abjured it.

**ARABIS**, bastard tower mustard, or wall-cress a genus of the class and order tetradynia, siliquosa. Nectariferous glands four, one within each leaf of the calyx, oblong, scale like, reflected, calyx closed, two of the leaves gibbous at the base, silicle linear, swelling at the seeds, entire and capitate at the tip. Twenty-one species, chiefly American and Alpine plants. The following are natives of our own country, 1 a thaliana, found on old walls 2 a stricta, on rocks and cliffs 3 a turrita, in Cambridgeshire and the neighbouring counties.

**ARABIST** : One skilled in the language and learning of the Arabians.

**ARABLE** *a* (from *aro*, Lat.) Fit for the plough, fit for tillage (*Dryden*)

**ARAC** See **ARRACK**

**ARACAN**, the capital of a small kingdom of the same name, lying to the N E of the bay of Bengal Lat 20 38 N Lon 93 10 E

**ARACHIS** Ground nut a genus of the class and order dialuphia, decandria. Calyx two-lipped, corol reversed, filaments all united, legume gibbous swelling at the seeds, veined, coriaceous. The only known species is of Indian birth, exhibiting two varieties.

**ARACHNE**, of Colophon, daughter to Idmon, a dyer, so skilful in working with the needle, that she challenged Minerva, to a trial of skill. She represented on her work the amours of Jupiter with Europa, Antiope, Leda, Astoria, Danae, Alcmena, though her piece was masterly, she was defeated by Minerva, and hanged herself in despair, and was changed by the goddess into a spider.

**ARACHNOID** Cobwebbed Covered with a thick interwoven pubescence, resembling a cobweb. Leaf, peduncle, calyx.

**ARACHNOID MEMBRANE** (*membrana arachnoidea*, from *arachne*, a spider, and *idea*, likeness, so named from its resemblance to a spider's web) 1 A delicate membrane of the brain, situated between the dura and pia mater, and surrounding the cerebrum, cerebellum, me-

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*dulla oblongata*, and *medulla spinalis* 2 The crystalline lens and vitreous humour of the eye.

**ARÆOMETER**, an instrument wherewith to measure the density or gravity of fluids The aræometer, or water-poise, is usually made of glass, consisting of a round hollow ball, which terminates in a long slender neck hermetically sealed at top there being at first as much quicksilver put into it as will serve to balance or keep it swimming in an erect position The stem, or neck, is divided into degrees or parts which are numbered, to shew, by the depth of its descent into any liquor, the lightness or density of it for that fluid is heaviest in which it sinks least, and lightest in which it sinks deepest

Another instrument of this kind is described by Homborg of Paris, in the *Memoirs of the Acad of Sciences* for the year 1699, also in the *Philos Trans* No 262, where a table of numbers is given, expressing the density of various fluids, is determined by this instrument both in summer and winter By this table it appears that the density, or specific gravity of quicksilver and distilled water, in the two seasons, were as follow, viz

in summer as	13 61 to 1,
in winter as	13 53 to 1,

and the medium of these two is as 13 57 to 1

See also the *Philos Trans* vol 36, or *Abridg* vol 6, for the description and use of another new aræometer, and Gregory's *Mechanics*, book III ch 2 for the description and theory of the ingenious aræometer of De Parcieux Other instruments for the same purpose will be described under the word **HYDROMETER**

**ARÆOMITRY**, the science of measuring the lightness and density of fluids—See the *Philos Trans* vol 68, for an essay on aræometry, &c

**ARÆOSTYLE**, in architecture, a term used by Vitruvius, to signify the greatest interval which can be allowed between columns

**ARAFAH**, the ninth day of the last month of the Arabic year, named Dhoulhegial, on which the pilgrims of Mecca perform their devotions on a neighbouring mountain called Arafat.

**ARAFAT**, or **GIRF EL ARAFAT**, a mountain near Mecca, where great numbers of pilgrims resort every year Certain stones are placed as boundaries to the sacred place Here the pilgrims, who are clad in robes of humility and mortification, earnestly beg the remission of their sins; imams, or priests, then pronounce a blessing upon them in a most solemn manner, and call them by the honourable title of Hadgees

**ARAHUM**, or **HARAMUM**, in ancient writers, denotes a place consecrated or set apart for holy purposes.

**ARAL**, a lake of Asia, lying on the E of the Caspian sea, from which it is distant above 150 miles It is about 300 miles long, and in places 150 broad

**LA Berry-bearing angelica** a genus of class and order pentandria pentagynia

## A R A

Flowers in an umbellet, with an involucre of calyx five-toothed, superior, corol five petalled berry five-seeded Ten species, of which some have entire, others lobed, and others decomposed and more than decomposed leaves They are natives of India, West Indies, or America

**ARAM** (Eugene), a man of considerable erudition, remarkable for his unhappy fate, and the singular circumstances that occasioned and attended it, was born at Ramsgill, a little village, in Netherdale, Yorkshire, in the year 1704 He was removed, when very young, together with his mother, to Skelton, near Newby and when he was five or six years old, his father making a little purchase in Bondgate near Rippon, his family went thither He was there sent to school, where he learned to read the New Testament in English, which was all he was ever taught, except that, some considerable time after, he was under the tuition of the reverend Mr Alcock of Burnsl, for about a month When he was about thirteen or fourteen years of age, he went to his father at Newby, and attended him in the family there, till the death of sir Edward Blackett It was in the house of this gentleman, to whom his father was gardener, that his propensity to literature first appeared He was, indeed, always of a solitary disposition, and uncommonly fond of retirement and books, and here he enjoyed all the advantages of leisure and privacy He applied himself at first chiefly to mathematical studies, in which he made a considerable proficiency At about sixteen years of age, he was sent to London to the house of Mr Christopher Blackett, whom he served for some time in the capacity of book-keeper After continuing here a year or more he was taken with the small-pox and suffered severely under that distemper He afterwards returned into Yorkshire, in consequence of an invitation from his father, and there continued to prosecute his studies, but found in polite literature much greater charms than in the mathematics, which occasioned him now chiefly to apply himself to poetry, history, and antiquities After this he was invited to Netherdale, where he engaged in a school and married But his marriage proved an unhappy connection, for to the misconduct of his wife he afterwards attributed the misfortunes that befell him In the mean while, having perceived his deficiency in the learned language, he applied himself to the grammatical study of the Latin and Greek tongues, after which he read, with great avidity and diligence, all the Latin classics, historians, and poets He then went through the Greek Testament, and, lastly, ventured upon Hesiod, Homer, Thucydides, Herodotus, and Thucydides, together with all the Greek tragedians In 1734, William Norton, esq a gentleman who had a friendship for him, invited him to Knarborough Here he acquired the knowledge of the Hebrew, and read the Pentateuch in that language In 1744 he returned to London, and served the reverend Mr Pamblanc, as usher in Latin

## A R A

and writing, in Piccadilly, and, with this gentleman's assistance, he acquired the knowledge of the French language. He was afterwards employed, as an usher and tutor, in several different parts of England, during which time he became acquainted with heraldry and botany. He also ventured upon Chaldee and Arabic, the former of which he found easy from its near connection with the Hebrew. He then investigated the Celtic, as far as possible, in all its dialects, and having begun to form collections, and made comparisons between the Celtic, the English, the Latin, the Greek, and the Hebrew, and found a great affinity between them, he resolved to proceed through all these languages, and to form a comparative lexicon. But in the midst of these learned labours and inquiries, it appears that Aram committed a crime, which could not naturally have been expected from a man of so studious a turn, and which is the more extraordinary, as the inducement that led him to it is said to have been only gain, though he himself afterwards assigned a different motive. On the 8th of February, 1744, 5, he murdered Daniel Clark, a shoemaker, in conjunction with whom, and another person, he seems before to have been concerned in some fraudulent practices. The murder, however, was concealed near fourteen years, and then was discovered by a skeleton being accidentally found, which was supposed to be that of Clark.

This was a mistake, but it led to a discovery of the whole transaction, and Aram's wife, from whom he had separated a considerable time, was a principal evidence against him. When he was apprehended on suspicion of this murder, he was usher of a school at Lynn in Norfolk. He was brought from thence to York-castle, and on the 3d of August, 1759, was tried at the county-assizes for the murder. He was found guilty on the testimony of Richard Houseman, corroborated by that of his own wife, and other circumstantial evidence. After his conviction, he confessed the justice of his sentence, but made an attempt upon his own life, by cutting his arm in two places with a razor, which he had concealed for that purpose. By proper applications, he was brought to himself, and, though weak, was conducted to the place of execution, where, being asked if he had any thing to say, he replied in the negative. He was immediately after executed, and his body being conveyed to Kniresborough forest, he was there hung in chains, pursuant to his sentence.

**ARANIA** Spider a genus of the class and order insecta, aptera. Mouth with short, horny jaws, the lip rounded at the tip, feelers two, incurved, jointed, and very sharp at the end, those of the male clavate, antennaless, eyes eight, rarely six, legs eight, abdomen ovate, villous, and furnished at the tip with textorial papillæ. A hundred and twenty-three species, chiefly inhabitants of Europe and America which may be usefully thus subarranged.

## A R A

A Eyes placed :

B Eyes

C Fyes

D Eyes

E Eyes

F Eyes

G Fyes

H Eyes

I I yes

K Fyes

L Eyes

M Eyes

N Eyes

O Eyes

P Fyes number and position unknown (See Nat Hist pl XXII) In every stage of their existence these insects prey with the most savage ferocity upon all other insects they can overcome, and even upon one another. From the papillæ at the end of the abdomen they throw out at pleasure a number of fine threads, which they unite in various ways for the purpose of entangling their prey. They exfoliate their old skin every year, which is performed by suspending themselves in some solitary corner, and creeping out of it. The younger ones have the power of flight, and in the autumn mount in the air to a great ascent, to perform which they probably climb some high eminence and are wafted about by the winds, filling the atmosphere with their fine threads. They are infested by the sphex and ichneumon. 1 The largest European spider is the *A. didema*, reddish brown, abdomen gibbous and marked with white drop-shaped spots in the form of a cross. It is often met with in trees in our own country, and is a very beautiful insect. 2 The *A. aquatica*, of a brown hue with cinereous ovate abdomen, the back marked with two imprinted dots, is found in the fresh water lakes of Europe, where it dives to the bottom in search of its food within the curious contrivance of a globule of air formed by itself, and takes up its winter quarters in a forsaken shell, the aperture of which it barricades with a web. 3 *A. acicularia* Thorax orbicular, convex, with a transverse central excavation, inhabits South America, among trees, where it preys upon the larger insects, and even small birds, dropping into their nests, and sucking their blood and eggs. It is of so enormous a size that its fangs are equal to the talons of a hawk, and its eyes capable of being

## A R B

set in the manner of lenses, and used as microscopes.

**ARA'NEOUS** *a* (from *aranea*, Lat a cobweb.) Resembling a cobweb (*Derham*)

**ARARAT**, the name of the mountain on which Noah's ark rested, after the abatement of the waters of the universal deluge. There are two opinions concerning the situation of this mountain. According to one opinion the ark rested on that part of the mountains now called Ararat in Armenia, near the spring of the Tigris, and styled by Latin writers the Gordian Mountains. According to the other, the ark rested on the top of mount Caucasus, in the confines of Tartary, Persia, and India. The former opinion is the most probable, (see Wells's Geog. Old Test. I. 30,) we may therefore state the situation of Ararat, in about lat 38 N Lon 46 W

**ARATEIA**, in antiquity, a yearly festival celebrated at Sicyon on the birth-day of Aratus

**ARATION** *s.* (*aratio*, Lat) The act or practice of ploughing

**ARATO-BAFABEN**, a fixed star of the 2d mag in Draco

**ARATORY** *a* (from *aro*, Lat to plough) That contributes to tillage

**ARATUS**, a Greek poet, was born in Cilicia about 300 B C. His poem entitled *Phenomena*, which is still extant, shews him to have been an astronomer, as well as a poet. It was translated by Cicero into Latin, and St Paul quotes a passage from it in his speech to the Athenians. Grotius published it in Greek and Latin at Leyden in 1600, 4to besides which there are several other editions

**ARAUCARIA** In botany, a genus of the class and order dioecia, monadelphia. Male calyx, scales of an ament, terminated by a leaflet, corolless, anthers ten or twelve without filaments. Fem calyx an ament with many germs, corolless stigma two-valved unequal, seeds numerous in a roundish cone. The only known species is a native tree of Chili

**ARAW**, a large town of Argow, in Switzerland, remarkable for its church, its fountain, and the fertility of its soil. Lat 47 20 N Lon. 8 0 E

**ARBALIST** *s* (*arcus* and *balista*) A crossbow (*Camden*)

**ARBELLA**, or **IRBIL**, a city of Curdistan, where Alexander the Great fought the last decisive battle with Darius III which put an end to the Persian empire. This happened in the year of the world 3724 Lat 35 5 N Lon. 42 35 E

**ARBITER**, in the civil law, implies a judge nominated by the magistrate, or chosen voluntarily by two contending parties, in order to decide their differences.

**ARBITRABLE** *a* (from *arbitror*, Latin) Arbitrary, depending upon the will (*Spel*)

**ARBITRAMENT** *s* (from *arbitror*, Lat) Will determination, choice (*Milton*)

**ARBITRARILY** *ad* (from *arbitrarius*)

## A R B

With no other rule than the will, despotically, absolutely (*Dryden*)

**ARBITRARINESS** *s* (from *arbitrary*) Despoticalness, tyranny (*Temple*)

**ARBITRARIOUS** *a* (from *arbitrarius*, Latin) Arbitrary, depending on the will (*Norris*)

**ARBITRARIOUSLY** *ad* (from *arbitrarius*) Arbitrarily, according to mere will and pleasure (*Glanville*)

**ARBITRARY** *a* (*arbitrarius*, Latin) 1 Despotick, absolute (*Prior*) 2 Depending on no rule, capricious (*Brown*)

To **ARBITRATE** *v a* (*arbitror*, Latin)

1 To decide, to determine (*Shakspeare*) 2 To judge of (*Milton*)

To **ARBITRATE** *v n* To give judgment (*South*)

**ARBITRATION**, is where the parties, injuring and injured, submit all matters in dispute, concerning any personal chattels or personal wrong, to the judgment of two or more arbiters or arbitrators, who are to decide the controversy. If these do not agree, it is usual for another person to be called in as umpire, to whose sole judgment it is then referred, or frequently there is only one arbitrator originally appointed. The decision, in any of these cases, is called an award, and thereby the question is as fully determined, and the right transferred or settled, as it could have been by the agreement of the parties or the judgment of a court of justice

**ARBITRATION**, or **COMPARISON OF EXCHANGE**, in arithmetic, determines the method of emitting to, or drawing upon, foreign places, in such a manner as shall be most advantageous to the merchant

*Arbitration* is either Simple or Compound

*Simple Arbitration* respects three places only. Here, by comparing the par of arbitration between a first and second place, and between the 1st and 3d, the rate between the 2d and 3d is discovered, from whence a person can judge how to remit or draw to the most advantage, and to determine what that advantage is

*Compound Arbitration* respects the case in which the exchanges among three, four, or more places are concerned. A person who knows at what rate he can draw or remit directly, and also has advice of the course of exchange in foreign parts, may trace out a path for circulating his money, through more or fewer of such places, and also in such order, as to make a benefit of his skill and credit and in this lies the great art of such negotiations. See Hutton's, Bonnycastle's, or Keith's Arithmetic

**ARBITRATOR** *s* (from *arbitrator*) 1 An extraordinary judge between party and party, chosen by their mutual consent (*Cow*)

2 A governor, a president (*Milton*) 3 He that has the power of prescribing to others without limit or control (*Addison*) 4 The determiner (*Shakspeare*)

**ARBITREMENT** *s* (from *arbitror*, Lat)

1 Decision, determination (*Hayward*) 2 Compromise (*Bacon*)

## A R B

**ARBOR** is figuratively used in mechanics for the principal part of a machine, which serves to sustain the rest — It is also used for a spindle, or axis, whereon a machine turns, thus, arbor of a crane, a mill, a windmill, &c

**ARBOR DIANÆ**, or **SILVER TREE**, is the result of a curious experiment in chemistry, by which the branches and figure of a tree are represented by an amalgam of silver and mercury, which appear to vegetate in a very beautiful manner To obtain it, one part of silver, dissolved in nitrous acid to saturation, is mixed with twenty parts of clean water, and poured upon two parts of mercury When left standing quietly, the desired crystallization will take place after some time A cylindrical glass vessel is best suited for the purpose, and that the process may succeed it is necessary that the ingredients be in their utmost purity (*Gren*) See **ARGENTUM**

**ARBOR MARTIS**, an apparent vegetation of iron, resembling a natural plant It is formed by dissolving iron filings in diluted nitric acid, and adding to the solution a quantity of carbonate of potash in a deliquescent state, or what was formerly called oil of tartar per deliquium The mixture swells considerably, and is no sooner at rest than the branches spring out on the surface of the glass

**ARBOR PLUMBI**, is a beautiful vegetation of lead To form it, two drams of acetate of lead (sugar of lead) are dissolved in six ounces of distilled water, the filtered solution is poured into a cylindrical glass, and a thin roll of zinc being hung in it, the whole is left standing at rest The lead precipitates, adhering to the zinc in metallic leaves, in the form of a tree

**ARBOR VITÆ** 1 The cortical substance of the cerebellum so disposed, that, when cut transversely, it appears ramified like a tree, from which circumstance it is termed *arbor vitæ* 2 The tree so named, the leaves and wood of this tree, *Thuya occidentalis*, strobils levisibus, squamis obtusis, of Linneus, were formerly in high estimation as resolvents, sudorifics, and expectorants, and were given in phthisical affections, intermittent fevers, and dropsies See **THUYA**

**ARBORARY** *a* (*arborarius*, Lat) Belonging to a tree

**ARBOREOUS** (*arboreus*) stem Single, woody and permanent, as the trunk or bole of a tree Opposed to shrubby, undershrubby and herbaceous

**ARBORESCENT** (*arborescens*) stem From herbaceous becoming woody

**ARBORET** *s* (*arbor*, Latin, a tree) A small tree or shrub (*Milton*)

**ARBORIST** *s* (*arboriste*, Fr) A naturalist who makes trees his study (*Houel*)

**ARBOROUS** *a* (from *arbor*, Lat) Belonging to a tree (*Milton*)

**ARBOUR** *s* (from *arbor*, Lat a tree) A bower, a place covered with green branches of trees (*Dryden*)

**ARBUSCLE** *s* (*arbuscula*, Lat) Any little shrub

## A R C

**ARBUSTIVA**, (from *arbutum*, a shrub) The name of the thirty-ninth order, in Linnæus's Fragment of a Natural Arrangement, in *Philosophia Botanica* The same with *Hesperideæ*, in his *Genera Plantarum* n 19

**ARBUTE** *s* (*arbutus*, Latin) Strawberry tree (*May*) See **ARBUTUS**

**ARBUTHNOT** (Dr John), was born in Kincardineshire, near Montrose, and was educated in physic at Aberdeen His talents and worth recommended him to the men of wit and learning of his day, and he entered into particular connection with Pope and Swift, with whom he joined in publishing several volumes of miscellanies, among which are the well-known *Memoirs of Martinus Scriblerus*, a satire of infinite humour on the abuses of human learning In 1715 he assisted Pope and Gay in the *Three Hours after Marriage*, a dramatic performance, which was brought upon the stage without success In 1727 he published *Tables of ancient coins, weights, and measures*, a work of great use, and real erudition In 1732 his valuable tract concerning the nature and choice of aliments appeared, which, the year after, was followed by his remarks on the effects of air on human bodies A constitutional asthma had distressed him at different periods of his life, and proved fatal to him in 1734

**ARBUTUS** Strawberry-tree a genus of the class and order decandria, monogynia Calyx five-parted, corol ovate, with a five-cleft mouth, pellucid at the base, berry superior, five celled, anthers with two pores Ten species scattered over the globe, of which the *uredo* is the only plant indigenous to the British empire, and has been found on the banks of the lake of Killarney Many of the others are introduced into our gardens by cultivation

**ARBUTUS**, TRAILING See **EPIGEA**

**ARBUTUS UVA URSI** The systematic name for the official woolly headed burdock See **UVA URSI**

**ARC** *s* A segment, or part of the circumference of a circle or other curve See **ARCH**

**ARC**, Joan of See **JOAN**

**ARCA** In zoology, a genus of the class and order vermes, testacea There is some doubt whether it be not a tethys Its shell is bivalve, equivalve, hinge with numerous sharp teeth alternately inserted between each other Forty-three species, in some the margin is very entire, beak reflected, and in some again, the margin is crenate, beak recurved It is to be found in the seas of every quarter of the globe One of the most common to the European seas is the *nucleus*, which is sometimes found fossil Size that of a hazel-nut, covered with an olivaceous skin under which it is white, within silvery shell unequally triangular, with very fine perpendicular striae crossed by a few arched, transverse ones, depression behind the beak heart-shaped See plate IX

**ARCADE**, in architecture, any opening in the wall of a building formed by an arch

## ARC

**ARCADIA**, in ancient geography, one of the six districts of Peloponnesus. It has to the north Achæa, to the east Argos and Laconia, Messenia to the south, and Elis to the west. According to Pliny, the wine of this country cured barrenness in women, and inspired the men with rage, and the berries of the yew gathered there were so strong a poison, that whoever slept or took refreshment under that tree were sure to die. In Strabo's time there were few cities remaining in it, most of them being destroyed in the Grecian wars. Eustatius says, that the country was anciently called Pelasgia, from Pelasgos, who brought the people, from roots, herbs, and leaves of trees, to feed on acorns, especially beechmast, as Artemidorus observes, that the Arcadians usually lived on acorns. It was also called Iycæonia, Gigantes, and Parrhasia (Stephanus). The Arcadians are greatly commended for their love of, and skill in, music.

**ARCADIA**, a town of the above province, near the gulph of the same name. Lat 37 24 N. Lon 21 42 E.

**ARCANUM**, (*arcanum*, a secret.) A medicine whose preparation or efficacy is kept from the world, to enhance its value.

**ARCANUM CORALLINUM**, red precipitate (red oxyd of mercury by nitric acid) in a mild state, rendered so by having spirit of wine burnt upon it.

**ARCANUM DUPLICATUM**, or the **DOUBLE SECRET**, a name by which the substance now called sulphate of potash was formerly known.

**ARCANUM TARTARI**, secret foliated earth, digestive salt of Sylvius, former names of acetate of potash, which see.

**ARCAS**, in astronomy, a name sometimes given to Arcturus.

**ARCESILAUS**, a celebrated Greek philosopher, about 300 years before the Christian era, was born at Pitane in Eoli. He founded the second academy, which is called the second school. He was a man of great erudition, and well versed in the writings of the ancients. He was remarkable for the severity of his criticism, but nevertheless he knew how to accommodate himself to the age, and pursue the allurements of pleasure. He had a great number of disciples. His doctrines were different in several respects from those of the ancient school, and perhaps he was led into this diversity of opinions by many capital errors in the ancient school, such as the incredible arrogance of the dogmatists, who pretended to sign causes for all things, the mysterious air they had thrown upon the doctrine of ideas, the entirely discarding the testimony of the senses, the objections of the Pyrrhonists, who now began to broach their opinions. the powerful opposition of the Stoics and Peripatetics, who discovered the feeble parts of the academic philosophy. These might have given cause to reform the ancient school, and to found a new one. The middle school, therefore, laid it down as a principle, that we could know nothing, nor even assure ourselves of the certainty of this position, from whence they

## ARC

inferred, that we should affirm nothing, but always suspend our judgement. They advanced, that a philosopher was able to dispute upon every subject, and bring conviction with him, even upon contrary sides of the same question, for there are always reasons of equal force both in the affirmative and negative of every argument. According to this doctrine, neither our senses, nor even our reason, are to have any credit, and therefore, in common affairs, we are to conform ourselves to received opinions.

**ARCH**, **ARC**, **ARCUS**, in geometry, a portion of any curve line, as of a circle, an ellipse, an hyperbola, a cycloid, &c.

It is by means of circular arches that angles are readily measured, the arch being described from the angular point as a centre. For this purpose every circle is supposed to be divided into 360 degrees, or equal parts, with their subdivisions, minutes, seconds, &c. and an arch, or the angle it subtends, and measures is estimated according to the number of degrees it contains. Circular and other arcs are also of very great use in finding fluents.

**ARCHES CONCENTRIC**, are such as have the same centre.

**ARCHES, EQUAL**, are such arches of the same or equal circles, as contain the same number of degrees. Hence, in the same or equal circles, equal chords subtend equal arches. —And hence, again, arches intercepted between parallel chords are equal.

*Similar arches*, of unequal circles, &c. are such as contain the same number of degrees, or the like parts of their respective whole circles. Hence, in concentric circles any two radii cut off or intercept similar arches. Similar circular arches are proportional to the radii of their respective circles, or to their whole circumferences. —Similar arches of other corresponding and like curves are also like parts of the wholes, or determined by like parts similarly posited.

To investigate the length of the arch of any curve. Let  $\tau$ , as usual, represent the absciss,  $y$  the ordinate of the arc  $z$  of any curve what-

ever. Put  $z = \sqrt{x^2 + y^2}$ , then, by means of the equation of the curve, find the value of  $x$  in terms of  $y$ , or of  $y$  in terms of  $x$ , and substitute that value instead of it in the above expression, hence, taking the fluents they will give the length of the arc  $z$  in terms of  $x$  or  $y$ . For numerous examples, see Dr Hutton's Mensuration. See also Emerson's, Holliday's, Rowe's, and Simpson's Fluxions, and Landon's Memoirs.

**ARCH DIURNAL**, and **NOCTURNAL**, of the sun, in astronomy, are parts of a circle parallel to the equator; the first being that which is described by the sun while above the horizon, the latter that described while he is under the horizon. A table of semidiurnal arcs is useful in finding the rising and setting of sun and stars. See White's Ephemeris, p. 40, and Vince's Astron. vol II. p. 393 and 466.

**ARC OF PROGRESSION** and **METROGRA-**



## A R C

**DAION**, of a planet, those arches of the ecliptic which it appears to describe while its motion is direct and retrograde respectively

**ARCH BETWEEN THE CENTRES**, in eclipses, an arch passing from the centre of the earth's shadow, perpendicular to the moon's orbit, meeting her centre at the middle of an eclipse

**ARC OF VISION**, that which measures the sun's depth below the horizon, when a star, before hid by his rays, begins to appear again The measures of this arc for various bodies are nearly as follows Mercury  $10^{\circ}$ , Venus  $5^{\circ}$ , Mars  $11\frac{1}{2}^{\circ}$ , Jupiter  $10^{\circ}$ , Saturn  $11^{\circ}$  Stars of 1st mag  $12^{\circ}$ , 2d mag  $13^{\circ}$ , 3d mag  $14^{\circ}$ , 4th mag  $15^{\circ}$ , 5th mag  $16^{\circ}$ , and 6th mag  $17^{\circ}$  But these measures are subject to slight variations

**ARCH**, in building, is an artful disposition of several stones, or bricks, or other suitable materials, generally in a bow-like form, by which their weight produces a mutual pressure and abutment, so that they not only support each other, and perform the office of an entire lintel, but may be extended to any width, and made to carry the most enormous weights

**ARCHES** are used in large intercolumniations of spacious buildings, in porticoes, both within and without temples, in palaces, halls, theatres, &c Also in covering cellars and powder magazines, gates, windows, &c And for the support of bridges and aqueducts They are supported by piers, buttments, imposts, and the like

Arches are constructed of various forms, and are designated by various names according to their figure As semicircular arches, those which make an exact semicircle scheme or skene arches, those which are less than semicircles, containing generally from 60 to 120 degrees elliptical arches, which usually consist of semiellipses cycloidal, catenarian, groined, &c Besides gothic and pointed arches, which will be spoken of farther on

As the strength and coherence of arches is of the utmost importance to the duration of any edifice of which they form a part, we trust we shall perform an acceptable service to many of our readers, by entering a little at large into the history and consideration of the principles which are of the greatest utility in this extensive department of the art of building

Arches are indeed the greatest performance of the masonic art, and at the same time the most difficult and delicate When we reflect on the immense quantity of materials thus suspended in the air, and compare this with the small cohesion which the firmest cement can give to a building, we shall be convinced that it is not by the force of the cement that they are kept together they stand fast in consequence of the balance of all their parts In order, therefore, to erect them with a well-founded confidence of their durability, this balance should be well understood and judiciously applied It is manifest that much depends, not only on the form of the arch, but on the disposition of the materials Sir Henry

## A R C

Wotton when considering this subject, says: First, All matter, unless impeded, tends to the centre of the earth in a perpendicular line — Secondly, All solid materials, as bricks, stones, &c in their ordinary rectangular form, if laid in numbers, one by the side of another, in a level row, and their extreme ones sustained between two supporters, those in the middle will necessarily sink, even by their own gravity, much more if forced down by any superincumbent weight To make them stand, therefore, either their figure or their position must be altered — Thirdly, Stones, or other materials, being figured cuneatum, or wedge like, broader above than below, and laid in a level row, with their two extremities supported as in the last article, and pointing all to the same centre, none of them can sink, till the supporters or buttments give way, because they want room in that situation to descend perpendicularly But this is a weak structure, because the supporters are subject to too much impulsion, especially where the line is long, for which reason the form of straight arches is seldom used, excepting over doors and windows, where the line is short and the side walls strong In order to fortify the work, therefore, we must change not only the figure of the materials, but also their position — Fourthly, If the materials be shaped wedgewise, and be disposed in form of an arch, and pointing to some centre, in this case neither the pieces of the said arch can sink downwards, for want of room to descend perpendicularly, nor can the supporters or buttments suffer much violence, as in the preceding flat form for the convexity will always make the incumbent rather rest upon the supporters, than thrust or push them outwards

It was towards the end of the 17th century when the Newtonian mathematics opened the road to true mechanical science, that the construction of arches began to engage the attention of able mathematicians Dr Hooke first suggested a principle that the figure into which a chain or rope, perfectly flexible, will arrange itself when suspended from two hooks, is, when inverted, the proper form for an arch composed of stones of uniform weight this he affirmed on the principle that the figure which a flexible festoon of heavy bodies assumes, when suspended from two points, is, when inverted, the proper form for an arch of the same bodies, touching each other in the same points, because the forces with which they mutually press on each other in this last case, are equal and opposite to the forces with which they pull at each other in the case of suspension This principle is just, and may, with due precautions, be extended to every case which can be proposed

Soon after Dr Hooke had laid down this principle, M de la Hire submitted the problem of the equilibrium of vaults to the laws of mechanics and in his *Traité de Mécanique*, published in 1690, founded upon the theory of the wedge the proportion according to which we must cause the absolute weight of the voûssors to be augmented from the key of the

## A R C H E S .

arch to the imposts, in a semicircular arch. The historian of the French academy of sciences remarked, under the year 1764, that Parent had determined according to the same principles, but solely by points, the figure which the extrados of a vaulted arch ought to have when the intrados is a semicircle, and farther that he had given the measure of the thrust of such an arch against the piers or abutments. We know not whether this solution has ever been printed.

The two illustrious brothers James and John Bernoulli, with Huygens and Leibnitz, having resolved, in 1691, the problem of the catenary, the geometers were not long before they perceived that the figure of that curve when inverted, is that which should be given to an arch composed of voussoirs infinitely small and uniformly heavy, in order that all its parts may be in equilibrio. David Gregory was the first who remarked this identity, in his ingenious dissertation on the catenary, published in the Philosophical Transactions, for the year 1707. He also observed that when arches of some thickness were supported in equilibrio, it was because in their shape some catenary was included, meaning obviously by the words "some catenary," some figure of similar nature with a catenary, but not supposed indefinitely thin in the vertical direction, such is the catenary formed with bits of chains, as described lower down in this article.

In the posthumous memoirs of James Bernoulli there are two direct solutions of the problem, founded on two different methods of considering the action of the voussoirs, the first is clear, simple, exact, and conducts readily to the true equation of the curve, which is a species of inverted catenary, the second has need of a little correction, which the author would undoubtedly have made himself had he lived to revise his memoir, and which Cramer, the editor of his works, has indicated by means of this correction may readily be found the equation of the catenary.

In the memoirs of the Academy of Sciences for the year 1712, la Hire, considering the problem of the thrust of arches, under a point of view indicated by some experiments, has given a solution, which, on account of the simplicity of the calculus and of the results it furnishes, was adopted with avidity by the majority of engineers and practical men. He supposed that the arches whose abutments have not a sufficient thickness to sustain the thrust, fail or break asunder about 45 degrees above the imposts. In consequence he regards the upper part of the arch as a wedge which tends to separate or to overturn the piers or the abutments, and he determines, by the theory of the wedge and the lever, the dimensions which they ought to have to resist an effort.

The same theory was likewise applied to domes in the *Essais et Recherches de Mathématique*, vol. III, published by M. Parent, in which the author extended and modified his theory of which we have before spoken, so as to apply to equilibrated arches in general. And

nearly the same principles were adopted by Couplet in the two parts of his memoir on the thrust of arches, published a few years after. The first part, printed in the memoirs of the French Academy for the year 1729, treats of the push of arches and the thickness of their abutments, by considering the voussoirs as infinitely smooth, or as capable of sliding one over another, without experiencing any resistance from friction. But as this hypothesis is not conformable to experiment, the second part of the memoir, inserted in the volume of the Academy for the year 1730, has for its object the same questions, assuming that the voussoirs have not the faculty of sliding over one another's surfaces, but that they may be raised and separated from one another by small motions of rotation. This theory is applied principally to circular arches. Couplet determines the proportion of the weights of the voussoirs, and the figure necessary to give to the extrados, with relation to a proposed intrados, but he has added very little to the theories of la Hire and Parent, and neither of them have treated the subject with the requisite generality and precision, as they relate either to theory or to practice. Muller, Riou, Clarke, and some other English authors, adopted, in like manner, the theories of la Hire and Parent, with slight modifications.

The volume of the French Academy for the year 1734, contains a memoir of Bouguer on the curve lines proper to form domes. He shews that we may employ for that purpose an infinity of curves, at the same time that he points out the manner of choosing the most advantageous. He supposes always that the voussoirs have their surfaces infinitely polished, and establishes upon this hypothesis the conditions of equilibration in every horizontal course of a vaulted dome. But Bouguer has not given any method of determining the thrust of domes, nor has he examined the law of the forces which ought to act upon the voussoirs when the generating curve is subjected to given conditions, though these are fruitful topics of curious and useful problems.

In the year 1772, Dr Hutton published at Newcastle, a valuable little treatise on the Principles of Bridges, founded upon that hypothesis which establishes an equilibrium among all the vertical pressures of the whole fabric contained between the soffit of the arch and the roadway, thus making an equality at every point of the curve, between all the adjacent pressures, when reduced to the tangential directions, or those that are perpendicular to the curve. This work is divided into five sections of which the 1st treats on the project of bridges, containing a regular detail of the various circumstances and considerations that are cognizable in such projects. The 2d treats on arches, demonstrating their various properties, with the relation between their extrados and intrados, and clearly distinguishes those curves which ought to be preferred in the construction of a bridge. The 3d section treats of the piers, demonstrating their thickness neces-

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sary for supporting any kind of an arch, springing at any height, both when part of the pier is supposed to be immersed in water, and when it is not in the 4th section is investigated the force of the water against the face of a pier, considered under different forms, and the best form for dividing the stream is pointed out and the 5th section contains a dictionary of the terms peculiar to the subject

About this time Mr Emerson gave some propositions relative to the theory of arches, in his *Fluxions*, and his *Mechanics*. And in the year 1776, gave in his "*Miscellanies*," an essay on the construction of arches, as well as some investigations concerning domes, adducing at the same time various reasons for preferring the theory advanced by Dr Hutton, which in fact agrees completely with that which was suggested by Hooke and Gregory

About this time also, the subject of arches and domes was investigated in all its generality by M Bossut, who examined the principal circumstances relating to the pressure of these two kinds of vaults in two memoirs printed among those of the French Academy of Sciences, for the years 1774 and 1776. Also, the 7th volume of the works presented to the said academy, contains under the date of the year 1773, an able memoir of M Coulumb, on some problems relative to architecture among these problems are found those of the equilibrium of arches, which the author has treated by a method directed to practical utility

In 1785, Cit Mascheroni published at Bergamo a work entitled *Nuove Ricerche sull'equilibrio delle Volte*, in which there are many curious propositions respecting the equilibrium of vaults, especially those of the dome kind, whether their bases are circular, elliptical, or polygonal. This author acknowledges himself indebted to the enquiries of Bossut

In 1801 and 1804, were published *A Dissertation on Arches*, and a *Supplement* to that *Dissertation*, by Mr Atwood, in which the wedge theory of La Hire, Parent, and Couplet, is adopted without any essential change, though that theory has been exploded, as inadequate, for more than thirty years, being indeed explained by Emerson in his *Miscellanies*, for no other purpose than to condemn it, and to shew its uselessness

In the year 1802, M Bossut, having made a great number of reflections both theoretical and experimental, since his first essay, published a new edition of his *Recherches sur l'Equilibre des Voutes*, in which he considers separately the equilibrium of arches and of domes. With regard to the former, he first gives the determination of the thickness of the piers and abutments, when the arch tends to break at given points of the haunches. 2dly, he treats of the relations which should subsist between the forces acting upon the voussoirs, and the figure of the arch, so that the whole system may be in equilibrium and 3dly, of the figure which should be given to the lateral exterior face of the abutments, when they can only fail in horizontal courses. In like manner, with respect to domes, he enters first upon the

determination of the requisite thickness of the feet of a dome, to resist the pressure of the upper segment, considered as a detached body. then he establishes the conditions of equilibrium between all the parts of a dome and lastly, the exterior figure of the feet or piers, to resist equally in every part a rupture in a horizontal direction. This treatise, and that of Dr Hutton beforementioned, are certainly the most able and useful of any we have yet met with on this interesting subject

If an arch be constructed, according to Dr Hooke's principle, of an inverted arch of bodies which adhered at their points of contact, it will remain in equilibrio, but it will be such an equilibrium as will admit of no disturbance for when the festoon is set up as an arch, if a small weight be laid on any part of it, it will bring the whole to the ground, because the shifting of the points of contact will be just the contrary to what it should be to suit the new curve. But if the same weight be laid on the same part of an arch similarly curved, but constructed with flat joints properly verging towards the centre of curvature, the whole will be sustained if the new curve still passes through the touching surfaces. Hence, it appears, that the longer the joints are, the greater will be the stability of the arch, other circumstances being the same

When an arch has no tendency to break in one part rather than in another, it is called an arch of equilibration, and in arches of this nature, every particular figure of the extrados, or upper side of the wall above an arch, requires a peculiar curve for the under side of the arch itself, so that the incumbent pressure on every part may be proportional to the strength or resistance there. we shall, therefore, now give a popular account of the general application of our assumed principle. Suppose, then, it be required to ascertain the form of an arch which shall have the span AB (fig 2 pl 14) and the height F8, and which shall have a roadway in the position CDE above it. Let the figure ACDEB be inverted so as to form a figure A c d e B, let a chain of uniform thickness be suspended from the points A and B, and let it be of such a length that its lower point will hang at, or rather a little below, f, corresponding to F. Divide AB into a number of equal parts, in the points 1, 2, 3, &c and draw vertical lines cutting the chain in the corresponding points 1, 2, 3, &c. Then take pieces of another chain, and hang them on at the points 1, 2, 3, &c of the chain A f B. This will alter the form of the curve. Cut or trim these pieces of chain, till their lower ends all coincide with the inverted roadway c d e. The greater lengths that are hung on in the vicinity of A and B will pull down these points of the chain, and cause the middle point f (which is less loaded) to rise a little, and thus bring it near to its proper height. This process (for which we are indebted to De la Hire) will produce an arch of equilibration, but, as Dr Robison remarks, some farther considerations are necessary to make it exactly suit our purpose. It is an arch of equilibration

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for a bridge that is so loaded, that the weight of the arch stones is to the weight of the matter with which the haunches and crown are loaded, as the weight of the chain  $A/B$ , is to the sum of the weights of all the little bits of chain, very nearly. But this proportion is not known beforehand, we must, therefore, proceed in the following manner adapt to the curve produced in this way a thickness of the arch-stones as great as are thought sufficient to ensure stability, then compute the weight of the arch stones, and the weight of the gravel or rubbish with which the haunches are to be filled up to the road-way. If the proportion of these two weights be the same with the proportion of the weights of chain, we may rest satisfied with the curve now found, but if different, it may easily be calculated, how much must be added equally to, or taken from, each appended bit of chain, in order to make the two proportions equal. Having altered the appended pieces accordingly, we shall get a new curve, which may perhaps require a very small trimming of the bits of chain to make them fit the road-way. This curve will be indefinitely near to the curve wanted. This method has been practised with success, and it is recommended to the mechanic, as any intelligent man, though ignorant of mathematics, may go through the process with little trouble, and it will give a very proper form for an arch under any conditions.

It would lead us too great a length were we to give the analytical investigations of the different cases which might arise. It appears, however, from the theory, that, in the hyperbolic arch, the extrados continually approaches nearer to the intrados, whereas in the circular and elliptic arches, it goes off continually farther from it, and in the parabola the two curves keep always at the same distance in the vertical direction.

But we must not neglect to inform the reader, that many facts have been adduced which shew great deviations from the legitimate results from the theory. For instance, circular arches commonly fail by the sinking of the crown and the rising of the flanks, while, according to the theory, in most cases, it ought to have been just the contrary. Still we do not mean to assert that the theory is erroneous; it is merely defective, leaving out circumstances which are of great importance; nay, it is probable the defects of the theory have arisen from the anxiety of mathematicians to make it perfect. It is supposed that the pressure on every part of the arch is vertical, but some loose materials, as gravel, earth, and rubbish, exert a kind of hydrostatical pressure laterally in the act of settling, and retain it afterwards. The arch-stones are supposed to be perfectly smooth or polished, and not to be connected by any cement, and therefore to sustain each merely by the equilibrium of their vertical pressure. The theory ensures this equilibrium, and this only, leaving unnoticed any other causes of mutual action.

The ingenious mathematical theory of equilibrated arches is of considerable utility, yet an engineer must not regulate his operations by this theory alone, but must call to his aid other considerations. It will be particularly advisable to attend to the procedure of nature in the failure of an arch. The matter may be considered thus: straight lines can be drawn within the arch stones at  $A$  (fig 3 pl 14.) to  $B$  and  $D$ , and from those to  $C$  and  $E$ . Each of the portions  $ED$ ,  $DA$ ,  $AB$ ,  $BC$ , resist as if they were of one stone, composing a polygonal vault  $EDABC$ . When this is overloaded at  $A$ , that point can descend in no other way than by pushing the angles  $B$  and  $D$  outwards, causing the portions  $BC$ ,  $DE$  to turn round  $C$  and  $E$ . This motion must raise the points  $B$  and  $D$ , and cause the arch stones to press on each other at their inner joints  $b$  and  $d$  thus producing a splintering at those joints, which indicates the total downfall by the rising of the flanks at  $B$  and  $D$ . That this is the process of nature has been verified by observation and experiment. Still, however, it appears difficult to point out the precise place where the tendency to break is most remarkable.

Mr Mylne the ingenious architect of Blackfriars bridge adopted a contrivance which determined this point with precision, by making it impossible for the overloaded arch to spring in any other place. Having thus confined the failure to a particular spot, he with equal art opposed a resistance which he believed to be sufficient the present condition of that noble bridge, which does not in any place shew the smallest change of shape, proves that he did not mistake. Looking on this work as a most excellent specimen of masonic ingenuity, we shall briefly describe the supposed principles of its construction.

The span  $ka$  (fig 1 pl 14.) of the middle arch is 100 feet, its height  $OV$  is 40, and the thickness  $KV$  of the crown is 6 feet 7 inches. Its form is nearly elliptical, the part  $AVZ$  being an arch of a circle whose centre is  $C$ , and radius 56 feet and the two lateral portions  $Akb$  and  $ZaE$  being arches described with a radius of 35 feet nearly. The thickness of the pier at  $ab$  is 19 feet. The thickness of the arch increases from the crown  $V$  to  $Y$ , where it is 8 or 9 feet. All the arch stones have their joints directed to the centres of their curvature. The joints are all joggled, having a cubic foot of hard stone let into each. By this contrivance the joints are kept from sliding, nor can any weight laid on the crown ever break the arch in that part, if the piers do not yield, for a straight line from the middle of  $KV$  to the middle of the joint  $YI$  is contained within the solid masonry, and does not even come near the joints of the arch-stones. Therefore the whole resists like one stone, and can be broken only by crushing it. The joint at  $Z$  is very nearly perpendicular to a line  $YF$  drawn to the outer edge of the foundation of the pier: this was intended to take off all tendency of the pressure on the joint  $dZ$  to overset the pier, for

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equilibration, that this pressure is necessarily exerted perpendicularly to the joint, its direction passes through the fulcrum at *F*, round which it is thought the pier must turn in the act of oversetting. This precaution was adopted, in order to make the arch quite independent of the adjoining ones, so that although any of them should fall this arch should run no risk.

Still farther to secure the independence of the arch, the following construction was practised to unite it into one mass which should rise all together. All that is below the line *ab* is built of large blocks of Portland stone, dovetailed with sound oak. Four places in each course are interrupted by equal blocks of Kentish rag, sunk half way in each course these act as joggles, breaking the courses, and preventing them from sliding laterally.

The portion *aY* of the arch is joggled like the upper part. The interior part is filled up with large blocks of Kentish rag, forming a kind of coursed rubble-work, the courses tending to the centres of the arch. The under corner of each arch-stone projects over the one below it, and by this form takes hold of the rubble behind it. Above this rubble the inverted arch *ICG* of Portland stone is constructed, it shares the pressure of the two adjoining arches along with the arch-stones in *Y a* and *G b*. Thus all tend together to compress and keep down the rubble work in the heart of this part of the pier. This is a very useful precaution, for it often happens, that when the centres of the arch are struck, before the piers are built up to their intended height, the thrust of the arches squeezes the rubble work horizontally, after the mortar has set, but before it has dried and acquired its utmost hardness. Its bond is broken by this motion, and it is squeezed up and never acquires its proper firmness.

Above this counter-arch is another mass of coursed rubble, and all is covered by a horizontal course of large blocks of Portland stone, butting against the back of the arch-stone *ZI* and its corresponding one in the adjoining arch. This course connects the feet of the two arches, preserves the rubble work from too great compression, and protects it from soaking water, which last circumstance is of great importance.

Now supposing the adjoining arch fallen, and all tumbled off that is not withheld by its situation, there will still remain in the pier a mass of about 3500 tons. The weight of the portion *VY* is about 2000 tons. The directions of the thrusts *KY* and *YI* are such, that it would require a load of 4500 tons on *VY* to overturn the pier round *F* this exceeds the constant weight on *VY* by 2500 tons, a weight incomparably greater than any that can ever be laid upon it.

Such, according to professor Robison, is the ingenious construction of Mr Mylne. Some engineers have attempted to withstand the horizontal thrusts of the arch by means of counter-arches extended much farther over the

main arch, as may be seen in M Perronet's work, but they are not well calculated for their intended purpose. A counter arch springing from any point between *Y* and *V* has no tendency to hinder that point from rising by the sinking of the crown, and such a counter arch will not resist the precisely horizontal thrust so well as the straight course of Mr Mylne.

We shall conclude this long article by two obvious deductions. 1 That the strength of circular arches of the same span are inversely proportional to the diameters of the circles of which those arches are parts. That is, as far as the strength depends upon the wedge-like figure of the blocks which compose the arches, and supposing the weight of each to be the same. 2 The span and height being the same, if the arch consisted of the flat side of an ellipse, it would be weaker than the circular arch, if it consisted of the other side of an ellipse (namely that of which the crown of the arch would be at the end of the transverse axis) it would be stronger.

On the important subject of this article, we would recommend the able treatises of Dr Hutton and M Bossut already referred to, the dissertation under the word Arch in the Supplement to the Encyclo Britan, the chapter on Arches and Domes in Gregory's Mechanics, and an anonymous article in No 79, Nicholson's Journal, N S.

**ARCH** (Centre of Gravity of) In estimating the effects of pressure upon a pier, it is necessary to know the situation of the centre of gravity of an arch. Now it has been proved, that the centre of gravity of the materials upon a curve in equilibrio will be in a vertical line that passes through the point of intersection of the tangents to the extreme point of the curve.

Let *alc* (fig 4 pl 14) be the curve loaded to the equilibrium, let *ad* be  $\tau$  tangent to the curve at *a*, *cd* a tangent to the curve at *c*, and *le* a tangent to the curve at *b* (the crown). The centre of gravity of the whole materials is in a vertical line which passes through *d*, and the centre of gravity of the materials over the arch *a, b*, is in a vertical line which passes through the point *e*, because the points *d* and *c* are respectively the points of intersection of the tangents, drawn from the extreme points of the portions in question of the curve.

To find the horizontal distance *af* of the centre of gravity of the materials contained between the crown and the abutment, from the latter. Drop a vertical line *ef*, from *e*, upon the ordinate *y*. Let *af* = *d*, and  $\tau$  and *y* be parallel to, and cotemporary fluxions of,  $x$  and *y* respectively. Then it is evident that  $\tau y + d (= ef) d (= af)$ ,

$$\text{therefore generally } d = \frac{\tau y}{2}$$

If the curve be the arch of a circle, *e, b* is the tangent of half the arch, which subtracted from half the span, leaves *d*, = sine of the arch — tangent of half the arch.

If the curve be the parabola  $d = \frac{1}{2} y$  If at

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be the equilibril curve with a horizontal ex-  
trados,  $d \approx \sqrt{\frac{2}{x+x}}$  Phil. Mag vol xi  
p 107

**ARCH** (Gothic, or Pointed), has undergone various modifications in its form At first it appears to have been composed of the two arcs which are described from the two lower angles of an equilateral triangle, to cross in a point at the vertex, and, as some suppose, originated in the intersection of two or more circular, or Saxon arches, as shewn in a figure in pl 15 Soon after, the pointed arch was made higher in proportion to its width And, in the 15th century, a new kind of low-pointed arch grew much into use It was described from four centres (pl 15), was very round at the haunches, and the angle at the top very obtuse This kind of arch is to be found in most of cardinal Wolsey's buildings But the Gothic arches of most complicated construction were used in the times of Richard II and Henry IV they were called contrasted Gothic arches, their construction is pointed out in the figure The plate also exhibits the north entrance to Peterborough cathedral, with the heads of Saxon columns, and the tower of York minster, a most elegant example of the modern Norman or florid style, taken from Essays on Gothic Architecture, published by Taylor

In the Transactions of the Irish Academy for 1789, there is an ingenious paper on the Origin and Theory of the Gothic Arch, by Dr M Young, which the curious reader may advantageously consult

**Mural Arch** See **MURAL ARCH**

**Arches of the different Orders** See **ARCHITECTURE**

**Triumphal Arches** are magnificent entries into cities, erected to adorn a triumph, and perpetuate the memory of the action The arches of Titus and Constantine make at this time a great figure among the ruins of ancient Rome

To **ARCH** *v a* (*arcus*, Latin) 1 To build arches (*Pope*) 2 To cover with arches (*Houel*) 3 To form into arches (*Bacon*)

**ARCH** *a* (from *αρχη*, chief) 1 Chief, of the first class (*Shakespeare*) 2 Waggish, mirthful (*Swift*)

**ARCHÆOGRAPHIA**, the art of describing antiquities

**ARCHÆUS** (*αρχαυς*, from *αρχη*, first, or chief) In the writings of Van Helmont, the vital power or principle of life

**ARCHANGELUS** (*archangelus*, Latin) One of the highest order of angels (*Norris*)

**ARCHANGEL** See **LAMIA**

**ARCHANGEL** (Baum-leaved) See **MELITTUS**

**ARCHANGEL** (Yellow) See **GALZOPSIS**

**ARCHANGEL**, or **GORDON ARCH-ANGEL-SKI**, the capital of the province of Dwina in Russia This was formerly a place of great trade, but since the building of Petersburg it has greatly diminished Lat. 61° 34' N Lon 39° 04'

## A R C

**ARCHANGE'LICK** *a* (from *archangel*) Belonging to archangels (*Milton*)

**ARCHBEACON** *s* (*arch* and *beacon*) The chief place of prospect, or of signal (*Ca-rem*)

**ARCHBISHOP** *s* (*arch* and *bishop*) A bishop of the first class, who superintends the conduct of other bishops his suffragans (*Shakspeare*)

Archbishops were not known in the east till about the year 320; and though there were some soon after this who had the title, yet that was only a personal honour, by which the bishops of considerable cities were distinguished It was not till of late that archbishops became metropolitans, and had suffragans under them

Athanasius appears to be the first who used the title archbishop, which he gave occasionally to his predecessor, Gregory Nazianzen, in like manner, gave it to Athanasius, not that either of them were intitled to any jurisdiction, or even any precedence, in virtue of it

The archbishop of Canterbury had anciently, viz till the year 1152, jurisdiction over Ireland as well as England, and was styled patriarch, and sometimes *alterius orbis papa*, and *orbis Britannici pontifex* Matters were done and recorded in his name thus, *anno pontificatus nostri primo*, &c The first archbishop of Canterbury was Austin, appointed by king Ethelbert, on his conversion to Christianity, about the year 598 He was also *legatus natus* He even enjoyed some special marks of royalty, as, to be patron of a bishoprick, which he was of Rochester, and to make knights, coin moneys, &c —He is still the first peer of England, and the next to the royal family, having precedence of all dukes, and all great officers of the crown It is his privilege, by custom, to crown the kings and queens of this kingdom He may retain and qualify eight chaplains, whereas a duke is by statute allowed only six

The archbishop of York has the like rights in his province, as the archbishop of Canterbury He has precedence of all dukes not of the royal blood, and of all officers of state, except the lord high chancellor He has also the rights of a count palatine over Hexamsire The first archbishop of York was Paulinus, appointed by pope Gregory about the year 622

Scotland, whilst episcopacy prevailed in that country, had two archbishops, of St Andrew's and Glasgow, of which the former was accounted the metropolitan, and, even before it arrived at the dignity of an archbishoprick, resisted with great spirit all the attempts of the archbishops of York in England to become the metropolitans of Scotland —Ireland has four archbishops, viz Armagh, Dublin, Cashel, and Tuam, of whom the former is primate of all Ireland

**ARCHBISHOPRICK** *s* (from *archbishop*) The state, province, or jurisdiction of an archbishop (*Clarendon*).



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The first establishment of archbishopricks in England, says Bede, was in the time of Lucius, said to be the first Christian king of England, who, after the conversion of his subjects, erected three archbishopricks, in London, York, and Landaff, then called Caerleon. The dignity of archbishop continued in the see of London 180 years, when it was translated to Canterbury, where it has continued ever since. York remains a metropolitan see to this day. The archbishop of Canterbury is styled Primate and Metropolitan of all England, and the archbishop of York, Primate and Metropolitan of England.

**ARCHBUTLER**, one of the great officers of the German empire, who presents the cup to the emperor on solemn occasions. This office belongs to the king of Bohemia.

**ARCHCHAMBERLAIN**, an officer of the empire, much the same with the great chamberlain in England.

**ARCHCHANCELLOR**, a high officer who, in ancient times, presided over the secretaries of the court.

**ARCHCHANCELLOR**, the president over the chorists of a church.

**ARCHCOUNI**, a title formerly given to the earl of Flanders, on account of his great power and riches.

**ARCHDEACON**, **ARCHIDIACONUS**. A church-officer vested with a jurisdiction over the laity and clergy, next after the bishop, either through the whole diocese, or only a part of it.

The archdeacon, sometimes also called archlevite, was originally the first and eldest of the deacons who attended on the bishop, whence his name.

An archdeacon was not known before the council of Nice. His function is since become a dignity, and even set above that of priest, though anciently it was quite otherwise. The archdeacon was the bishop's chief minister for all external concerns, and particularly the administration of the temporalities. He took care that order and decency were observed in divine service, looked to the ornaments and utensils of the church, had the direction of the poor, and the inspection of the manners and behaviour of the people, for which reason he was called the bishop's heart, and eye, *oculus episcopi*, and *cor episcopi*.

We have sixty archdeacons in England. Their office is to visit every two years in three, to enquire into the reparations and moveables belonging to the church, reform abuses in ecclesiastical matters, and bring the more weighty affairs before the bishop, besides which, they have also a power to suspend, excommunicate, and in many places to prove wills, and in some to institute to benefices.

It is one part of the archdeacon's office to induct all clerks into their benefices within his jurisdiction, and, by the act of uniformity, he is now obliged to be in priest's orders.

Many archdeacons, in old foundations, have, by prescription, their courts and officials, as bishops have.

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**ARCHDRUID**, the chief or pontiff of the ancient druids.

**ARCHDUKE**, a title peculiar to the house of Austria, all the sons of which are archdukes, and daughters archduchesses. See **Duke**.

**ARCHE** (*αρχη*, the beginning) In medicine, the first stage, or attack of a disease.

**ARCHED** (*formicatus*) In botany, as the upper petal of the aconite, and the upper lip of some ringent flowers. (See **VAULTED**) It should seem that either term might be adopted indifferently.

**ARCHED**. A horse is said to have arched legs when his knees are incurvated or bent archwise. This term relates only to the fore quarters, and the defect here alluded to is generally occasioned by excess of travel. The horses called brassicourts likewise have their knees bent, but in a different manner, and proceeding from a natural deformity while the real arched leg is the constant result of mismanagement.

**ARCHELAUS**, in biography, a Greek philosopher, was born either at Miletus or Athens. He was a disciple of Anaxagoras at Lampsacus, occupied the chair of that philosopher after his death, and may be considered as the last preceptor of the original Ionic school. Afterwards he removed to Athens, and with him the Ionic school was removed thither. Here he acquired distinguished reputation by publicly teaching the doctrines of Anaxagoras concerning natural bodies, whence he was denominated the Natural Philosopher. Among the scholars of Archelaus, who were numerous, Socrates was eminently distinguished, and under him philosophy assumed a new character.

**ARCHERS**, a kind of militia, or soldiery, armed with bows and arrows. The word is formed of *arcus*, a bow, whence *arcuarius*, and even *argus* and *argutes*, as they are denominated in corrupt Latin.

**ARCHERY**, the art or exercise of shooting with a bow. With most of the ancient nations, the bow was the principal implement of war, and by the expertness of the archers alone was often decided the fate of battles and of empires. Even in this island archery was greatly encouraged in former times, and many statutes were made for its regulation, whence it was that the English archers in particular became the best in Europe, and procured many signal victories. The Artillery Company of London, though they have long disused the weapon, are the remains of the ancient fraternity of bowmen or archers. Artillery (*artillerie*) is a French term signifying archery, as the king's bowyer is in that language styled *artiller du roi* and from that nation the English seem to have learnt at least the cross-bow archery. We therefore find that William the Conqueror had a considerable number of bowmen in his army at the battle of Hastings, when no mention is made of such troops on the side of Harold, and it is supposed, that these Norman archers shot with the arbalest (or cross-bow,) in which



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formerly the arrow was placed in a groove, being termed in French a *quadril*, and in English a *hott*. Of the time when shooting with the long-bow first began among the English, at which exercise they afterwards became so expert, there appear no certain accounts.

In the use of the bow, great dexterity as well as strength seems to have been requisite. Though we hear of arrows at Cheviot Chase which were a yard long, yet is it by no means to be supposed that the whole hand made use of such or could draw them to the head. The regulation of the Irish statute of Edward IV. viz. that the bow shall not exceed the height of a man, is allowed by archers to have been well considered, and as the arrow should be half the length of the bow, this would give an arrow of a yard in length to those only who were six feet high. A strong man of this size in the present times cannot easily draw above twenty-seven inches, if the bow is of a proper strength to do execution at a considerable distance. At the same time it must be admitted, that as our ancestors were obliged by some of the old statutes to begin shooting with the long-bow at the age of seven, they might have acquired a greater sleight in this exercise than their descendants, though the latter should be allowed to be of equal strength.

An arrow, when shot from a long-bow at a proper elevation, has been often projected to the distance of 220 yards, and sometimes, under peculiar advantages of situation, to a greater distance. The force with which an arrow has been often shot, was such as caused it to pierce through an inch board of well-seasoned timber. And, as to time, an archer could shoot six arrows in the time of once charging and discharging a musket.

Though archery continued to be encouraged by the kings and legislature for more than two centuries after the first knowledge of the effects of gunpowder, yet by the latter end of the reign of Henry VIII. it seems to have been rather considered as a pastime. Since that period the employment of it for warlike purposes has long ceased in Europe, and the bow and arrow, so formidable in the days of our ancestors, have been only seen in the hands of children. As a manly exercise, however, the fashion of archery has of late years been revived in various societies in Britain, particularly the Toxopholite, Woodmen of Arden, the Royal Company of Archers in Scotland, &c. which are countenanced by the first of our nobility, but their meetings are merely for the purpose of conviviality and recreation.

**ARCHES**, or **COURT OF ARCHES**, the supreme court belonging to the archbishop of Canterbury, to which appeals he from all the inferior courts within his province.

**ARCHITYPE**, **ARCHETYPUS**, the first pattern, or model, by which any work is formed, or which is copied after, to make another like it.

The word is compounded of *αρχη*, beginning, and *τυπη*, type.—In this sense the word

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coincides with original, or prototype, and stands opposed to copy.

Among minters, &c. archetype is peculiarly used for the standard or original weight, by which the other weights are to be adjusted and examined.

**ARCHILOCHUS**, a famous Greek poet and musician, was, according to Herodotus, contemporary with Candaules and Gyges, kings of Lydia, who flourished about the 14th Olympiad, 724 years before Christ. But he is placed much later by modern chronologists, viz. by Blair 686, and by Priestley 660 years. **B C**

He was born at Paros, one of the Cyclades. His father Telesicles was of so high a rank, that he was chosen by his countrymen to consult the oracle at Delphos concerning the sending a colony to Ithica—a proof that he was of one of the most distinguished families upon the island. However, he is said to have sullied his birth by an ignoble marriage with a slave called Iμπο, of which alliance our poet-musician was the fruit.

Though Archilochus shewed an early genius and attachment to poetry and music, these arts did not prevent his going into the army, like other young men of his birth, but in the first engagement at which he was present, the young poet, like Horace, and like our own Suckling, lost his buckler, though he saved his life by the help of his heels. It is much easier, said he, to get a new buckler, than a new existence. This pleasantry, however, did not save his reputation, nor could his poetry or prayers prevail upon Lycambes, the father of his mistress, to let him marry his daughter, though she had been long promised to him. After these mortifications, his life seems to have been one continued tissue of disgrace and resentment.

Archilochum proprio rabies armavit iambo  
Hor Art Poet 70

Archilochus, with fierce resentment warm'd,  
Was with his own severe iambics arm'd.

Francis

The rage of Archilochus was proverbial in antiquity, which compared the provoking this satyrist to the treading upon a serpent, a comparison not very severe, if it be true that Lycambes, and, as some say, his three daughters, were so mortified by his satire, as to be driven to the consolation of a halter.

In this piece many adventures are mentioned, full of defamation, and out of the knowledge of the public. There were likewise many loose passages in it, and it is said to have been on account of this satire that the Lacedaemonians laid a prohibition on his verses.

However, according to Plutarch, there is no bard of antiquity by whom the two arts of poetry and music have been so much advanced, as by Archilochus. To him is attributed particularly the sudden transition from one rhythm to another of a different kind, and the manner of accompanying those irregular measures upon the lyre. Heroic poetry, in hexameter verse, seems to have been solely in use among

the more ancient poets and musicians; and the transition from one rhythm to another, which lyric poetry required, was unknown to them so that, if Archilochus was the first author of this mixture, he might with propriety be styled the inventor of Lyric Poetry, which, after his time, became a species of versification wholly distinct from heroic.—To him is likewise ascribed the invention of epodes

Archilochus was slain by one Calloudax Corax, of the island of Naxos, who, though he did it in fight, according to the laws of war, was driven out of the temple of Delphi, by command of the oracle, for having deprived of life a man consecrated to the muses

ARCHILOCHIAN, a term in poetry, applied to a sort of verses, of which Archilochus was the inventor. These consist of seven feet, the first four whereof are ordinarily dactyls, though sometimes spondee, the three last trochees for instance

Solvitur acris hylms grata vice veris et Favoni  
Hor

It is usual to mix iambic verses of six feet, abating 1 syllable, with Archilochian verses, thus Horace himself has done in the ode now cited

ARCHIMAGIA (from *αρχη*, the chief, and *μαγα* Arab contemplation) Chemistry, as being the chief of sciences

ARCHIMAGUS the high priest of the Persian Magi, or worshippers of fire. He resided in the highest fire temple, which was held in the same veneration with them, is the temple of Mecca among the Mahometans. Zoroistres first stultid it at Balch, but after the Mahometans had over-run Persia in the 7th century, the archimagus was forced to remove from thence into Kerman, a province of Persia, lying on the southern ocean, where it hath continued to this day. Darius Hystaspes took upon himself the dignity of archimagus for Porphyry tells us, he ordered before his death, that among the other titles, it should be engraven on his monument, that he had been Master of the Magi, which plainly implies that he had borne this office among them, for none but the archimagus was master of the whole sect

ARCHIMANDRITE, the superior of a monastery, amounting to what we now call abbot

ARCHIMEDES, a great mathematician, was born at Syracuse, and was related to Hiero, king of that place flourishing about 240 years before Christ. His method of discovering the fraud of a jeweller who had been employed to make a crown for Hiero, discovers the singular penetration of his mind. That monarch, suspecting that the crown which he had ordered did not contain the quantity of gold which he had given to the workman, desired Archimedes to find out the fraud. His thoughts being intent upon this problem while he was in the bath, he observed that a quantity of water overflowed equal to the bulk of his body. This shewed him at once how the problem was to be solved, and he ran home-

wards, crying out *εureka! εureka!* I have found it, I have found it! Then procuring two masses of gold and silver of equal weight with the crown, he carefully noticed the quantity of water which each displaced, after which he observed how much the crown caused to flow over, and on comparing this quantity with each of the former, he was able to ascertain the proportions of gold and silver in the crown

—Some ancient authors celebrate a glass machine made by Archimedes, which according to them represented exactly the motions of the heavenly bodies, and he is also said to have made burning glasses which destroyed ships at a great distance. Archimedes became most famous by his curious contrivances by which the city of Syracuse was so long defended, when besieged by the Roman consul Marcellus, showering upon the enemy sometimes long darts and stones of vast weight and in great quantities, at other times lifting their ships up into the air, that had come near the walls, and dashing them to pieces by letting them fall down again, nor could they find their safety in removing out of the reach of his cranes and levers, for then he contrived to set fire to them with the rays of the sun reflected from burning glasses. However, notwithstanding all his art, Syracuse was at length taken by storm, and Archimedes was so very intent upon some geometrical problem, that he neither heard the noise, nor regarded anything else, till a soldier that found him tracing lines asked his name, and upon his request to be gone, and not disorder his figures, he slew him. What gave Marcellus the greatest concern, says Plutarch, was the unhappy fate of Archimedes, who was at that time in his museum and his mind, as well as his eyes, so intent upon some geometrical figures, that he neither heard the noise of the Romans nor perceived the city to be taken. In this depth of study and contemplation, a soldier came suddenly upon him, and commanded him to follow him to Marcellus, which he refusing to do till he had finished his problem, the soldier in a rage drew his sword, and ran him through. Livy says he was slain by a soldier not knowing who he was, while he was drawing schemes in the dust, that Marcellus was grieved at his death, and took care of his funeral, and made his name a protection and honour to those who could claim a relationship to him. His death it seems happened about the 142d or 143d Olympiad, or 210 years before the birth of Christ

The expression which Archimedes made use of to king Hiero is well known. Give me a fixed point, said the philosopher, and I will move the earth from its place. This affords matter for a curious calculation, viz to determine how much time he would have required to have moved the earth only one inch. Ozanam, after making proper allowances, states the time at 3,653,745,176,803 centuries! See Hutton's Ozanam, part 5

A whole volume might be written upon the curious methods and inventions of Archimedes,

that appear in his mathematical writings now extant only. He was the first who squared a curvilinear space, unless Hippocrates must be excepted on account of his lunes. In his time the conic sections were admitted into geometry, and he applied himself closely to the measuring of them, as well as other figures. Accordingly he determined the relations of spheres, spheroids, and conoids, to cylinders and cones, and the relations of parabolas to rectilinear planes whose quadratures had long before been determined by Euclid. He has left us also his attempts upon the circle: he proved that a circle is equal to a right-angled triangle, whose base is equal to the circumference, and its altitude equal to the radius, and consequently, that its area is equal to the rectangle of half the diameter and half the circumference, thus reducing the quadrature of the circle to the determination of the ratio between the diameter and circumference, which determination however has never yet been effected, though we have very neat approximations by Archimedes and others.

Besides these figures, he determined the measures of the spiral, described by a point moving uniformly along a right line, the line at the same time revolving with a uniform angular motion, determining the proportion of its area to that of the circumscribed circle, as also the proportion of their sectors.

Many of the works of this great man are still extant, though the greatest part of them are lost. The pieces remaining are as follow:

- 1 Two books on the Sphere and Cylinder —
- 2 The Dimension of the Circle, or proportion between the diameter and the circumference —
- 3 Of Spirals —
- 4 Of Conoids and Spheroids —
- 5 Of Equiponderants, or Centres of Gravity —
- 6 The Quadrature of the Parabola —
- 7 Of Bodies floating on Fluids —
- 8 Lemmata —
- 9 Of the Number of the Sand.

The most complete edition now extant of the works of Archimedes, is the magnificent one in folio, printed at Oxford in 1792. This edition was prepared ready for the press by the learned Joseph Torelli, of Verona, and in that state presented to the university of Oxford. The Latin translation is a new one. At the end of the whole a large appendix is added, in two parts, the first being a Commentary on Archimedes's paper upon Bodies that float on Fluids, by the rev. Abram Robertson of Christchurch college, and the latter is a large collection of various readings in the manuscript works of Archimedes, found in the library of the late king of France, and of another at Florence, as collated with the Basil edition.

**ARCHIMIA**, (from *αρχη*, chief, and *χημια*, chemistry) Alchemy, or the transmutation of metals.

**ARCHIMIME**, among the Romans, denoted the same in effect as an arch-buffoon, or mimic.

**ARCHIPELAGO**, in geography, a sea ingulfed by a great number of islands. Thus the *Indo* denotes a considerable part of the

Mediterranean Sea, having Romania on the north, Natolia on the east, Macedonia, Livadia, and the Morea, on the west, and the isle of Candia on the south. It is partly in Europe, and partly in Asia, containing the islands of Rhodes, Negropont, Lemnos, Samos, Patmos, &c. &c.

**ARCHIPRESBYTER** See **ARCHPRIEST**.  
**ARCHISYNAGOGUS**, in the Jewish history, the chief or ruler of the synagogue.

**ARCHITECT**, *s* (*architectus*, Lat.) 1 A professor of the art of building (*Watton*). 2 A builder (*Milton*). 3 The contriver of any thing (*Shakspeare*).

**ARCHITECTIVE**, *a* (from *architect*) That performs the works of architecture (*Derham*).

**ARCHITECTONIC**, *a* (from *αρχη*, chief, and *τεχνη*, an artifice) That has the power and skill of an architect (*Boyle*).

**ARCHITECTURE**, the art of building, or erecting edifices, whether for habitation, for worship, for ornament, or for defence: it is subdivided into civil, military, and naval.

**ARCHITECTURE** (Civil), called absolutely and by way of eminence architecture, is the art of constructing edifices for the uses of civil life in every capacity, as bridges, churches, dwelling houses, colleges, halls, palaces, temples, &c.

**ARCHITECTURE** (Military), is the art of strengthening and fortifying places, to screen them from the insults of enemies, and the violence of arms. This we more usually call fortification.

**ARCHITECTURE** (Naval) or **SHIP-BUILDING**, is that which teaches the constructions of ships, galleys, and other floating vessels for the water, with ports, mols, docks, &c. on the shore.

That architecture is of great antiquity is undeniable. But the primitive buildings were very different from the specimens of architecture we now meet with in civilized countries. In those mild climates which seem to have been the first inhabited parts of this globe, mankind stood more in need of shade from the sun than of shelter from the inclemency of the weather. A very small addition to the shade of the woods, served them for a dwelling. Sacks laid across from tree to tree, and covered with brushwood and leaves, formed the first houses in those delightful regions. As population and the arts improved, these huts were gradually refined into commodious dwellings. The materials were the same, but more artfully put together. At last agriculture led the inhabitants out of the woods into the open country. The connection between the inhabitant and the soil became more constant and more interesting. The wish to preserve this connection was natural, and fixed establishments followed of course. Durable buildings were more desirable than those temporary and perishable cottages, stone was substituted for timber. But as these improved habitations were gradual refinements on the primitive hut, traces of its construction remained, even when

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the choice of more durable materials made it in some measure inconvenient. Thus it happens that the trunks of trees, upright, represent columns, the girths or bands, which served to keep the trunks from bursting, expressed bases and capitals, and the summers, laid across, gave a hint of entablatures, as the coverings, ending in points, did of pediments — See pl. 16

We shall not enter minutely into a history of the progress of architecture, but shall shew that the above view of ornamental architecture will go far in accounting for some of the more general differences of national style which may be observed in different parts of the world. The Greeks borrowed many of their arts from their Asiatic neighbours, who had cultivated them long before. It is highly probable that architecture travelled from Persia into Greece. In the ruins of Shushan, Persepolis, or Tchilminar, are to be seen the first models of every thing that distinguishes the Grecian architecture. There is no doubt, we suppose, among the learned, as to the great priority of these monuments to any thing that remains in Greece, especially if we take into account the tombs on the mountains, which have every appearance of greater antiquity than the remains of Persopolis. In those tombs we see the whole ordonnance of column and entablature, just as they began to deviate from their first and necessary forms in the wooden buildings. We have the architrave, frieze, and cornice, the far projecting mutules of the Tuscan and Doric orders, the modillions no less distinct, the rudiments of the Ionic capital, the Corinthian capital in perfection, pointing out the very origin of this ornament, viz. a number of long graceful leaves tied round the head of the column with a fillet, a custom which we know was common in their temples and banqueting rooms. Where the distance between the columns is great, so that each had to support a weight too great for one tree, we see the columns clustered or fluted, &c. In short, we see every thing of the Grecian architecture but the sloped roof or pediment, a thing not wanted in a country where it hardly ever rains. In the stone-buildings of the Greeks, the roofs were imitations of the wooden ones, hence the lintels, flying corniches, ceilings in compartments, &c.

The ancient Egyptian architecture seems to be a refinement on the hut built of clay, or unburnt bricks mixed with straw every thing is massive, clumsy, and timid, small intercolumniations; and hardly any projections.

The Arabian architecture seems a refinement on the tent. A mosque is like a little camp, consisting of a number of little bell tents, stuck close together round a great one. A caravansary is a court surrounded by a row of such tents, each having its own dome. The Greek church of St Sophia at Constantinople has imitated this in some degree, and the copies from it, which have been multiplied in Russia as the sacred form for a Christian church, have adhered to the original model of clustered tents

in the strictest manner. We are sometimes disposed to think that the painted glass (a fashion brought from the east) was an imitation of the painted hangings of the Arabs.

The Chinese architecture is an evident imitation of a wooden building. Sir George Staunton says, that the singular form of their roofs is a professed imitation of the cover of a square tent.

The great incorporation of architects who built most of the cathedrals of Europe departed entirely from the styles of ancient Greece and Rome, and introduced another in which arcades made the principal part. Not finding in every place quarries from which blocks could be raised, in abundance, of sufficient size for forming the far-projecting corniches of the Greek orders, they relinquished those proportions, and adopted a style of ornament which required no such projections and having substituted arches for the horizontal architrave or lintel, they were able to erect buildings of vast extent with spacious openings, and all this with very small pieces of stone. The form which had been adopted for a Christian temple occasioned many intersections of vaultings, and multiplied the arches exceedingly. Constant practice afforded opportunities of giving all possible varieties of these intersections, and taught the art of balancing arch against arch in every variety of situation. In a little time arches became their principal ornament, and a wall or ceiling was not thought properly decorated till it was filled full of mock arches, crossing and butting on each other in every direction. In this process in their ceilings these architects found that the projecting mouldings, which we now call the Gothic tracery, formed the chief support of the roofs. The plane surfaces included between those ribs were commonly vaulted with very small stones, seldom exceeding six or eight inches in thickness. This tracery, therefore, was not a random ornament. Every rib had a position and direction that was not only proper, but even necessary. Habituated to this scientific arrangement of the mouldings, they did not deviate from it when they ornamented a smooth surface with mock arches, and in none of the highly ornamented ancient buildings shall we find any false positions. This is far from being the case in most of the modern imitations of this species of architecture.

We call the middle ages rude and barbarous, and give to their architecture the appellation Gothic, but there was surely much knowledge in those who could execute such magnificent and difficult works. The more appropriate terms, we conceive, would be those of Saxon and Norman architecture, at least, so far as relates to such works in Britain, giving the first term to that kind distinguished by the circular arch, and the latter to that distinguished by the pointed arch for under the guidance of these respective nations did each kind principally display its grandeur and peculiarities.

The architects of whom we now speak do not appear to have studied the theory of equili-

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brated arches: but, for a long period, they adopted an arch which was very strong, and permitted considerable irregularities of pressure, we mean, the pointed arch. The very deep mouldings with which it was ornamented, made the arch-stones very long in proportion to the span of the arch. They had, however, with great care, studied the mutual thrust of arches on each other, and they contrived to make every invention for this purpose become an ornament, so that the eye required it as a necessary part of the building. Thus we frequently see small buildings having buttresses on the sides. These are necessary in a large vaulted building, for withstanding the outward thrust of the vaulting, but they are useless when there is a flat ceiling within. Pinnacles on the heads of buttresses are now considered as ornaments, but originally they were put there to increase the weight of the buttress even the great tower in the centre of a cathedral, which now constitutes its chief ornament, is a load almost indispensably necessary, for enabling the four principal columns to withstand the combined thrusts of the aisles, of the naves, and transepts. In short, the more closely we examine the ornaments of this architecture, the more shall we perceive that they are essential parts, or derived from them by imitation: and the more we consider the whole style of it, the more clearly do we see that it is all deduced from the relish for arcades, indulged in the extremes, and pushed to the limit of possibility of execution.

From the end of the 15th century, this architecture began to decline, and was soon after supplanted by a mixed style, if we may venture to call it so, wherein the Grecian and Gothic, however discordant and irreconcilable, are jumbled together. Concerning this mode of building, Mr Warton, in his observations on Spenser's Fairy Queen, has the following anecdotes and remarks.

"Although the Roman or Grecian architecture did not begin to prevail in England till the time of Inigo Jones, yet our communication with the Italians, and our imitation of their manners, produced some specimens of that style much earlier. Perhaps the earliest was Somerset-house in the Strand, built about the year 1549, by the duke of Somerset, uncle to Edward VI.

"In the year 1613, the magnificent portico of the schools at Oxford was erected, in which, along with the old Gothic style, the architect has affectingly displayed his extraordinary skill in the Grecian and Roman architecture, and has introduced all the five orders together.

"In the 15th and 16th centuries, when learning of all kinds began to revive, the chaste architecture of the Greeks and Romans seemed, as it were, to be recalled into life. The first improvements of it began in Italy, and soon owed their existence to the many ruins of the ancient Roman structures that were to be found in that country, from whence an improved method of building was gradually introduced into the other countries of Europe

and though the Italians for a long time retained the superiority as architects, over the other European nations, yet as men of genius from all quarters constantly visited Italy for the purpose of improvement in architecture, as well as the other arts, since that period they have been equalled, if not surpassed, by architects of other nations, and even of our own country.

The orders, as now executed by architects, are five, viz the Tuscan, the Doric, the Ionic, the Corinthian, and the Composite, which are distinguished from each other by the column with its base and capital, and by the entablature. The Tuscan order is characterized by its plain and robust appearance, and is therefore used only in works where strength and plainness are wanted, it has been used with great effect and elegance in that durable monument of ancient grandeur, the Trajan column at Rome. Indeed, general consent has established its proportions for such purposes beyond all others. The Doric possesses nearly the same character for strength as the Tuscan, but enlivened by its peculiar ornaments, the triglyph, mutule, and guttae or drops under the triglyph, these decorations characterize the Doric order, and in part are inseparable from it. Its proportions recommend it where united strength and grandeur are wanted. The Ionic partakes of more delicacy than either of the former, and therefore as well as on account of its origin, is called Feminine and not improperly supposed to have a matronical appearance. It is a medium between the masculine Tuscan and Doric, and the virginal slenderness of the Corinthian the boldness of the capital, with the beauty of the shaft, makes it eligible for porticoes, frontispieces, entrances to houses, &c. Dentils were first added to the cornice of this order. The Corinthian possesses more delicacy and ornament than any other order, the beauty and richness of the capital, and the delicacy of the pillar, render it the most suitable in those edifices where magnificence and elegance are required. On this account it is frequently used for the internal decoration of large state rooms, in which it has a chaste appearance, though at the same time superb. The Composite order is the same as the Corinthian in its proportions, and nearly alike in ornamental properties. The addition of the modern Ionic volute to the capital, gives a bolder projection. It is applicable in the same manner and in the same cases as the Corinthian. See the plates of the different orders: also the observations upon each order in the following system.

The first complete system of architecture we meet with is that of Vitruvius, who lived in the reigns of Julius Caesar and Augustus. Since Vitruvius, the principal authors are Alberti, Baldus, Barbarus, Blondel, Cataneo, Demonisius, Freard, Goldmann, Guilielmus, Langley, Mayer, Nicholson, Paine, Palladio, Perrault, Rivius, Serlio, Scamozzi, Vignoli, and Ware. On the subject of Gothic architecture, we refer to *Essays on Gothic Architecture*, published by Taylor, and to a paper

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## GENERAL PRINCIPLES OF ARCHITECTURE

### Sect I *Of Composition and Harmony in Building*

Architecture being a useful and fine art, leads us to apply the practice of it in three different ways, first for utility, secondly, for ornament, and thirdly, for the construction of such buildings, or parts of buildings, as require both effect in ornaments and usefulness of parts

Buildings, intended solely for utility, ought in every part to correspond with that design. Any material deviation from usefulness for the sake of ornament ought to be strictly avoided. Works of entire usefulness are considered as a mean to some end, and the nearer they approach to a perfect mean for obtaining that end, the more will such structures gain our applause, though every beauty of ornament be neglected. On the other hand, in such works as are merely calculated for ornament, beauty alone ought to be regarded. In this case, the art of which we are treating is capable of exciting a variety of noble feelings, as veneration, admiration, rapture and astonishment. The principal difficulty, however, is to combine the qualities of usefulness and agreeable effect in ornamental structures. The most practicable method is to prefer utility to ornament in proportion as the character of the building will admit of it. In palaces, and such buildings as are capable of a variety of useful contrivance, regularity ought to be preferred, but in dwelling-houses that are on too small a scale for variety of contrivance, regularity should give place to usefulness, so far at least as the former stands in direct opposition to the latter.

In considering attentively the beauty of visible objects, we discover two kinds. The first may be termed intrinsic beauty, because it is discovered in a single object, without relation to another. The second may be termed relative beauty, being founded on a combination of relative objects. Architecture admits of both kinds.

There is a sort of beauty or harmony in the whole character of a building with relation to its intended occupier. Vitruvius, Palladio, and other ancient writers, have been careful to inculcate this doctrine, as absolutely necessary to be observed by a good architect. Indeed it is founded on self-evident principles, for all will admit, that the appearance of a palace ought to convey an idea of the majesty and grandeur which are peculiar to monarchs, so that a common observer may pronounce, on the first view of such an edifice, that it is destined to be the habitation of so dignified a personage. Nature herself is a precedent for this doctrine. The vaulted canopy of the heavens, and all their richly ornamented spheres, constitute a glorious temple that most accurately bespeaks

the character of its divine possessor. The conformity should appear in temples made with hands, and in those inferior structures erected by art for the accommodation of the various classes of human society. Palladio has a remark to the following effect. If the architect is employed to build a house for any public officer of the nation, such as an ambassador, or prime minister, &c he should introduce porticos, galleries, and magnificent halls, richly adorned, in order that such as attend on business, or visit the possessor, may be agreeably interested and amused while they wait. In all cases, regard is to be paid to the dignity, rank, or profession of the occupier, rather than to his wealth. But if a building is destined to some particular and public profession, then we should regard the public use for which it is intended, without confining our ideas to the quality of any individual proprietor. A playhouse must have a gay and splendid style, a heathen temple, though these are now far removed from us, is considered as a house dedicated to some divinity, and therefore in conformity to its destination, it must be elevated, magnificent, and grand, and as the dark mysteries of the heathen theology required something gloomy to give them an air of reality and sanctity, these temples were contrived to produce a somewhat dark and gloomy appearance. But we by no means ought to infer from this, that our churches should be so managed, for we do not believe, with a certain architect, that dimness, obscurity, and gloom, produce that tone of mind which is favourable to humility and devotion. The style of a church ought to be grave, bold, and magnificent, affording a proper quantity and equal distribution of light to every part used in the time of worship. The appearance and style of a monument ought to be solemn and gloomy, so ornamented as to awaken the memory of the deceased in the minds of surviving friends. Courts of justice, senate houses, or the like, have also their proper style, which will always be observed by good architects.

### Sect II *Of the Beauty of Proportion*

The proportions of a door are determined by the use to which it is destined. The door of a dwelling house, which ought to correspond to the human size, is confined to seven or eight feet in height, and three or four in breadth. Those proportions assigned to a stable or coach-house, are different. The door of a church ought to be wide, to afford an easy passage to a multitude, and its height should therefore be in proportion, that its appearance may please the eye. The size of windows ought always to be in proportion to the dimensions of the room they are intended to illuminate, for if the apertures, or openings, be not large enough to convey light in an equal distribution to every part of the room, the whole will have a deformed appearance. Steps of stairs should likewise receive a suitable proportion, and be accommodated to the human figure, without relation to the magnitude of any other part of



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the building, and therefore in small and in larger houses they are alike in size, because men are nearly alike in stature. The proportions of rooms are either intrinsic or relative, though in most cases both are included. The intrinsic proportion of a room is its length, breadth, and height, which being properly adjusted, we pronounce it of a beautiful proportion, without regard to any other part of the building. But the relative beauty of proportion is as the whole area of the room is to the magnitude of the house of which it composes a part. A room may be well proportioned as to itself, but may, at the same time, be either too large or too small for the whole edifice. In a sumptuous building, the capital rooms ought to be large, otherwise they will not be proportioned to the size of the whole, and for the same reason a very large room is improper in a small house, yet every house ought to have both large and small rooms, in proportion to itself. Yet in things thus related, the mind requires not a precise or single proportion, rejecting all others, on the contrary, different proportions are sometimes equally agreeable to contemplate. It is only when a proportion becomes loose and distant, that the agreeableness abates and at last vanishes. With regard to the proportion the height of a room should bear to the length and breadth, it must be rather uncertain in some cases, arising from that deception to which the eye is subject when its height exceeds 16 or 17 feet, yet if a proper optical allowance be made, we do not think the attainment of a beautiful proportion so hazardous or arbitrary a task as some architects would insinuate. A room 48 feet in length, and 24 in breadth and height, is well proportioned, but it is well known, that were we to reduce those to 12 and 24, a room would approach too near the appearance of a gallery. Yet it is evident that, if the proportion be so adjusted as to be in the medium between these two, a room cannot produce a bad effect as to its size. For instance, if the height and breadth be 18 feet each, and the length 36 feet, this proportion of a room is by architects termed harmonic, or agreeable to the eye, answering to diapente, one of the chords in music, which includes the interval from 1 to 5, and is agreeable to the ear.

It is, however, evident, that the doctrine of harmonic proportions of rooms is not quite perfect, otherwise there could be no exceptions taken in any case. Not so in the proportion of sounds, every chord is alike pleasing upon any scale, and though some of the chords are less perfect than others, yet all of them produce harmony to every ear capable of the sweet sensation of music. We therefore are disposed to conclude that though there exists a considerable agreement between the doctrine of sounds and the dimensions of a room, yet they are not perfectly parallel, consequently the judicious architect will make his own exceptions. With respect to the figure of rooms little need be said, as it is self-evident that those of four sides with right angles are best adapted for the

reception of light and the distribution of furniture. Those, however, of the circular or regular polygonal kind are preferable, when the light comes in by an aperture in the roof or ceiling.

## Sect III *Of the external Proportions of Houses*

In the country where gentlemen's houses are detached, and are easily viewed at front and depth by an approaching traveller, a strict regard to proportion becomes necessary, for if the cube form be adopted in very large houses it will appear uncouth and heavy, whilst, on the other hand, it is equally disagreeable to see a dwelling house approach to the appearance of a lofty tower. Very high dwelling houses prove exceedingly inconvenient, and therefore where beauty of proportion is connected with utility, they ought rather to assume the figure of a parallelopipedon resting on its larger base. Hence that form of building which rather spreads upon the ground than rises in height, is always preferred. In towns the houses being generally attached to each other, they unitedly compose a regular street or square, in which case, the proportions of an individual front are less obvious, and their depth in this respect immaterial. The great object of concern is the uniformity of the whole when completed, or of one individual house with the whole. In these situations, the proportions of houses, and the length and extent of streets, are rather subject to acts of parliament than to architectural laws.

There are four different rates into which the proportion of houses in town are divided or classed by the legislature. The first rate, or houses of the largest size, are such as exceed nine squares of building, those of the second rate are from five to nine squares, those of the third from three and a half to five squares, and of the fourth, not exceeding three squares and a half. Their height is regulated in like manner, and the thickness of their walls and chimneys. Under such restrictions the architect must often proceed under great disadvantages, and must occasionally call forth the good quality of docility recommended by Vitruvius.

## Sect IV *Of the Situation and internal Division of Houses*

This is certainly a subject highly worthy of the notice and choice of an architect. It must be obvious that a rising ground is much better suited for a magnificent palace than a concealed valley, and that it would be incongruous and absurd to erect a sumptuous building on a wild, uncultivated, and barren ground, destitute of water, woods, hills, or other natural beauties, which nature has assigned to various and even extensive portions of the earth.

Where such situations are left to the choice of the architect, it becomes him to apply his taste in fixing the precise situation or bearings of his intended work, in the execution of which he must attend to the four cardinal



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points In the first place he must observe, that every internal division or room may receive a due degree of light and heat, suited to its intended use, and the different seasons in which it is more particularly to be occupied. Here the skilful architect must exercise several of those qualifications enumerated by the famous Vitruvius, as essentially requisite to the formation of his character. And indeed whatever qualifications are absolutely necessary in the proper choice of the situation and plan of a town or city, the same will be wanted to complete a country residence. The first and grand objects of human concern in this life are health, pleasure, and convenience, and whatever contribute to these must be studied with great care.

Hence the necessity of a situation best adapted for good air, a sufficient supply of wholesome water at a convenient distance for family use, fertile grounds, whose produce in summer may impregnate and render salubrious the element in which we breathe. Directly opposed to these considerations are marshy, low, and barren lands, where even the hardy brute animal will scarcely thrive. Stagnant waters must more especially be avoided.

Palladio says, the infallible marks of a good situation for health are where the cattle thrive, and the inhabitants look ruddy and cheerful. In fixing on the precise spot of ground, that which is moderately elevated, if it be contiguous to some river, will be best adapted for health, pleasure, and most probably for convenience too. In such a situation, the air acquires a constant motion and free circulation, by which it purifies itself as water does by a current, and becomes more salutary to the human frame. And nothing can so much contribute to the excellence of a prospect as a river, especially a winding one, the beauty of which will, in idea, be heightened by its utility as the means of supplying water for family use. These most essential preliminaries being settled, the architect proceeds to consider in what direction his front and flank are to be placed with respect to the south or north points. This, in many instances, will be closely connected with the internal division of the house, which assigns to each room its particular use and season. Cool drawing-rooms are suitable for summer, and for this purpose they should be large, and situated towards the north, or so as to be screened from the scorching beams of the sun. Warm drawing rooms are adapted for winter, and therefore these should be small, and have a place towards the south, or where the reviving rays of the sun can have free intercourse. Rooms appropriated for spring and autumn may be in a medium situation to these, and should have their windows to look into the different gardens or green walks. Libraries, studies, breakfast and other morning rooms, should have the same sort of prospect, as being most conformable to morning exercises. Finally, if the house be built on so large and magnificent a scale as to admit the same variety in all the

different apartments, then the dining-parlour, bed rooms, &c. will be subject to the same laws of situation, and answerable to the different seasons of the year.

The several offices, which have a place in the plan of houses now described, should be so arranged as to appear to compose an inferior part of the whole building, not totally detached, yet in such order as to keep the more offensive ones as remote as possible from the principal parts of the house. This indeed is the true doctrine of nature, for if we compare the several parts of a building to the various members which compose an animal frame, we see that the most beautiful parts are most conspicuous, whilst those that are less comely either recede from the view, or are quite concealed.

## Sect V *Of the various Ornaments which contribute to give a peculiar Expression or an apparent Usefulness to Buildings*

It has been doubted whether a building can admit of any ornament but such as are useful, or at least have the appearance of being so. But considering architecture no less as a fine than a useful art, both kinds may be properly introduced. A private house, and other edifices, where use is the chief aim, admit not indeed of any ornaments but such as have the appearance of utility. But temples, triumphal arches, and such buildings as are chiefly intended for show, may be highly ornamented without any regard to their seeming usefulness. Hence it is that a threefold division of ornaments has been suggested. These are, 1st. Ornaments that are beautiful without relation to use, such as statues, vases, &c. 2d. Objects in themselves not beautiful, but possessing the beauty of utility, by imposing on the spectator, and appearing to be useful, such as blind windows. 3d. Where things are beautiful in themselves, and at the same time assume the appearance of use, such as pilasters. With regard to the first, we naturally require that a statue shall be so placed as that it may be seen in every direction, and at various distances, by having an opportunity of receding or advancing as we please. Statues placed in the niches of fronts of houses, or on the tops of their walls and roofs, ought not to be admitted. Their proper places are in large halls, and in passages that lead to a grand staircase, &c. To adorn the top of the wall with a row of vases, is an unhappy conceit, by placing a thing, whose natural destination is utility, where it cannot have even the least appearance of it. Now, firmness and solidity being the proper expressions of a pedestal, and, on the contrary, lightness and delicacy of carved work, the pedestal, whether of a column or of a statue, ought to be sparingly ornamented. The ancients never ventured on any bolder ornament than the basso-relievo.

With respect to ornaments of the second kind, it is a great blunder to contrive them so as to make them appear useless. A blind window, therefore, when necessary for regularity, ought to be so disguised as to appear a

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real window, when it appears without disguise, it is disgusting, as a vain attempt to supply the want of invention, it shows the irregularity in a stronger light, by signifying that a window ought to be there in point of regularity, but that the architect had not skill sufficient to connect external regularity with internal convenience.

As to the third, it is an error to sink pilasters so far into the wall, as to remove totally, or mostly, the appearance of use. They should always project so much from the wall, as to have the appearance of supporting the entablature over them.

From ornaments in general, we descend to a pillar, the chief ornament in great buildings. The destination of a pillar is to support, really, or in appearance, another part termed the entablature. With regard to the form of a pillar, it must be observed, that a circle is a more agreeable figure than a square, a globe than a cube, and a cylinder than a parallelepipedon. Thus last, in the language of architecture, is saying, that a column is a more agreeable figure than a pilaster, and for that reason it ought to be preferred, when all other circumstances are equal. Another reason concurs, that a column annexed to a wall, which is a plain surface, makes a greater variety than a pilaster. Besides, pilasters at a distance are apt to be mistaken for pillars, and the spectator is disappointed when, on a nearer approach, he discovers them to be only pilasters.

With respect to buildings of every kind, one rule, dictated by utility, is, that they be firm and stable. Another, dictated by beauty, is, that they also appear so to the eye for every thing that appears tottering, and in hazard of tumbling down, produces in the spectator the painful emotion of fear, instead of the pleasing emotion of beauty, and accordingly it should be the great care of the artist, that every part of his edifice appear to be well supported. Some have introduced a kind of conceit in architecture, by giving parts of buildings the appearance of falling, of this kind is the church of St Sophia in Constantinople.

The most considerable ornaments used in architecture are the five orders of columns, pediments, arches, balusters, &c. of which we shall now speak.

## OF THE FIVE ORDERS OF ARCHITECTURE

### SECT. I. *Of the several Parts and Members of an entire Order.*

The principal parts of an entire order are three; the pedestal, shaft, and entablature. These principal parts are again subdivided as follows: the pedestal contains the plinth *a* (see Tuscan order, pl 3) the dado *b*, and the cornice *c*. The column includes a base *d*, a shaft *e*, and a capital *f*. The entablature consists of an architrave *g*, a frieze *h*, and a cornice *i*.

Thus, in every entire order, there are three principal parts, and each of these is again subdivided into three smaller parts, which, in

all, make nine. The origin of these names is explained in the following manner.

The plinth takes its appellation from *πλινθος*, a brick or flat square stone on which columns in the most early state of architecture are supposed to have stood.

The dado, or dye, is so called because it is of a cubic form.

The cornice is derived from *coronis*, a top or summit, because the cornice is the extreme end or finishing of the pedestal.

The base of the column is from *βασίς*, a foundation or footing for the column.

The shaft, that long and straight part of a column comprehended between the base and capital, is so named from *σκαπτός*, to dig, in the manner of a well, round and deep, whose inside resembles the shape of a pillar.

The capital, from *κεφαλή*, or *caput*, the head, which the capital is to a column.

The architrave, from *αρχος*, chief or principal, and *trabē*, a beam, because the architrave is the chief support to the whole entablature.

The frieze is so called from *εἶσρον*, a border or fringe, or which some of the ancients used to call *ζυμφορος*, because their friezes were usually enriched with the figures of animals.

The cornice of the entablature, or the crowning part of the entire order, needs no other explanation than that already given.

These nine principal parts of a complete order, the dado and shaft excepted, are composed of small members, which constitute all that simple and pleasing variety of mouldings which adorned the works of the ancients. The names of these mouldings allude to their forms, and their forms are adapted to the purposes for which they were intended. The names of these members, with their origin and use, are as follows (see references to the Doric order, pl 3.)

- Fig 1 The fillet, from the French word *fil*, thread.
- 2 The cymatium, or *cyma recta*, from *κύματις*, a wave, because this member resembles the swelling and concavity of a wave.
- 3 The cyma reversa, the preceding member inverted.
- 4 The corona, or crown, because it is the principal member of the cornice, and serves as a shelter to the smaller mouldings of the entablature.
- 5 The ovolo, from *ovum*, an egg, because this member by the ancients was frequently carved in the form of eggs.
- 6 The cavetto, from *cavus*, hollow.
- 7 Capital, or upper fillet of the triglyph.
- 8 Triglyph, from *τρίγλυφο*, three engravings, compounded of *τρι*, three, and *γλυφω*, to carve, or engrave, in conformity to which, the triglyph has two entire channels and two half ones, with three spaces between.

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Fig 9 The metope, from *μετοπή*, the space between one aperture or hole to another, the triglyphs being supposed to be joists that fill the apertures hence the space between the triglyphs, which forms an exact square, is termed the metope

10 The frieze we have already explained

11 The band, the same as fillet

12 The drops, *guttae*, are of a conical figure

13 Architrave See the foregoing explanation

14 The facia, or face, of which there are two in the architrave

15 The abacus, from *αβαξ*, a shelf or table, or, as some suppose, a tile, on which the ancient mathematicians strewed dust, to draw their geometrical schemes on The word seems to have been introduced into architecture on the invention of the Corinthian capital, which some say took its rise from an acanthus growing round a basket

16 The ovolo of the capital, which in this situation must be considered, the basket round which the acanthus grew

17 Annulets, because these small fillets encompass the capital, like rings joined to each other The moderns, in place of these, generally have a small cavetto

18 Colorino, collar, or neck of the capital

19 The astragal, from *αστραγαλος*, a bone of the heel, or, the curvature of the heel, which this member resembles The hollow which follows is termed *απαφυγη*, escape, because this part of the column appears to fly off

20 & 22 Upper and lower torus, from *τορος*, a cable, which this moulding somewhat resembles

21 The scotia, from *σκοτια*, darkness, because of the strong shadow which its concavity produces, and which is increased by the projecting torus above

The other references have already been explained, therefore we shall now proceed to take notice of the members or parts of other Doric entablatures which are not found in this In some of the Doric entablatures are mutules, from *mutuli*, modillions, which are placed perpendicularly over each triglyph, and are of the same width, and whose projection in the corona is the same, forming a perfect square In others are dentils, as in the theatre of Marcellus at Rome These are so named from *dentelli*, teeth, which they resemble, and the flat member on which these dentils are placed is termed denticulus The capitals of the Ionic, Corinthian, and Composite (see pl 4) have each of them volutes, so called from

*volvendo*, to roll round, as on a staff Some call the volutes the horns of the capital, because they resemble the twisting of ram's horns

After this enumeration of all the members or distinct parts of the different orders, it may be proper to observe, that those parts which are termed mouldings are only eight in number viz the fillet or cincture to bind the parts The astragal also and torus, resembling ropes or cables, are strong binders and fortifiers of the parts with which they are connected. The ovolo is strong at its extremities, and is therefore fit to support projecting parts The cyma recta, inversa, and cavetto, are covering mouldings, which serve to shelter the other smaller members There are various methods of describing the contours of these, but the simplest, and perhaps the best, is to form them of quadrants of circles

## Sect II Of the Diminution of Columns

In effecting the diminution of the shaft of a column, the ancients adopted a variety of methods, beginning sometimes from the foot of the shaft, and at others from one quarter, or one third of its height, the lower part being perfectly cylindrical The former of these was most in use amongst the ancients, and, being the most natural and graceful, ought to have the preference, though the latter has been more universally practised by modern artists

M Blondel, in his book entitled *Resolution des quatre principaux Problemes d'Architecture*, teaches various manners of diminishing columns, the best and simplest of which is by means of the instrument which Nicomedes invented to describe the first conchoid for this, being applied at the bottom of the shaft, performs at one sweep both the swelling and the diminution, giving such a graceful form to the column, that it is universally allowed to be the most perfect practice hitherto discovered. The columns in the Pantheon, accounted the most beautiful among the antiques, are made in this manner, as appears by the exact measures of one of them to be found in Desgodetz's *Antiquities of Rome*

To have an accurate idea of the operation, it will be necessary first to describe Vignola's method of diminution, on which it is grounded Having determined the height of the shaft, draw a line indefinitely from D (pl 14) through C, perpendicular to the axis OP of the column, take then ID, half the inferior or largest diameter of the column, and place one foot of the compasses exactly on the extremity of the superior or smallest diameter, as at R, and depress the other, till it come into the axis or centre line of the shaft, as at S under O, through these two points draw a line indefinitely and produced till it cut the line DC, as at A, from A, the centre, draw any number of lines through the axis OP, as S, r, S, r, &c and on each of these place half the larger diameter of the shaft set off from the axis or perpendicular line OP, through which points,

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thus found, if a curve line be drawn, it will describe this swelling and proper diminution of the column.

Though this method be sufficiently accurate for practice, especially if a considerable number of points be found, yet, strictly speaking, it is defective, as the curve must either be drawn by hand, or by applying a flexible ruler to all the points, both of which are liable to variations. Blondel, therefore, to obviate this objection, after having proved the curve passing from O to R through the points *r*, *r*, to be of the same nature with the first choncoïd, employed the instrument of Nicomedes to describe it the construction of which is as follows. This instrument is made of wooden laths in the triangular form described by PO, PC, and ABR (pl 14), the base and perpendicular of which are joined together at P, and has a stay the upright OP has a groove cut in it (see fig 5). To the lath ABR at S is fixed a button (see the fig), which passes along the groove from P to O, in the moving lath ABR is a common groove, cut through from A to B, and at A, in the lath DC, is fixed a button at the centre A, as described in the first method. The length of the groove AB must exceed the difference of the length AS to AP, consequently, as the button S works in the groove OP, the groove AB permits it to move forward to P, by which the former swelling and diminution will be most correctly performed when a pencil is fixed at R, at a distance from the button S, equal to half of the largest diameter of the column. It must be owned, however, that if the centre were moved considerably towards P, that this method would not describe a perfect curve or agreeable diminution, for in this case, the curve at the top of the shaft will proportionally approach to a straight line, and at last almost become an inverted curve. This, however, is no reasonable objection to the use of the instrument when applied to the diminution of columns, for the greatest quantity of diminution that can in any case be allowed, will not have the least perceptible effect on the curve, and therefore we may venture to affirm, that no other method yet discovered, nor any other instrument that can be invented by man, is likely to exceed it. It is farther to be observed, that Nicomedes's instrument may be made to answer shafts of any dimensions, by making the respective grooves capable of extension by the use of sliders and moveable centres, which any architect is capable of contriving. In the remains of antiquity, the quantity of diminution is various, but seldom less than one-eighth of the inferior diameter of the column, nor more than one-sixth. The last of these is esteemed the most perfect by Vitruvius, and is generally adopted by modern architects.

## SECT. III. *Of the Origin, Character, Use, and Proportions of the Tuscan Order*

This order had its name and origin in Tus-  
 cany one of the most considerable of the Ita-

lian states, which was first inhabited by the ancient Lydians from Asia. This people first built temples of this order, and dedicated them to their idols in their new settlements. It is the most solid and simple of all the orders. It is composed of few parts, devoid of ornaments, and so massy, that it seems capable of supporting the heaviest burden. There are no remains of a regular Tuscan order among the antiques the doctrine of Vitruvius concerning it is obscure, and the profiles of Palladio, Scamozzi, Serlio, de l'Orme, and Vignola, are all imperfect.

This order, on account of its strong and massive proportions, has obtained the name of the rustic order, in conformity to which character, it is generally employed in farm houses, stables, and such-like edifices. It is, however, sometimes used in superior buildings, where ornaments are not required, but where strength is the principal object. The proportion of the Tuscan column, with its pedestal and entablature, is as follows.—Divide the whole height of the entire column into five equal parts, one of which is for the height of the pedestal, and the remaining four are assigned for the base, shaft, capital, and entablature. The whole height being divided into five equal parts, one is given for the entablature, and the remaining four being divided into seven equal parts, one is for the inferior diameter of the shaft\*. Take half of the inferior diameter for the height of the base, including the plinth, and the same for the height of the capital, exclusive of the astragal. Take the inferior diameter, and divide it into 60 equal parts, which are called minutes, and by which the smaller parts of the column are proportioned in their height and projections, as specified in the upright and horizontal scales attached to the profile, from which the several proportions of each moulding must be learned. A module is considered by some to be only half a diameter, but others extend it to a whole one, which we have adopted as the most simple and entire. Palladio uses the whole diameter in every order except the Doric. Vitruvius also employs the large module, reckoning the proportion of the column by the lower or inferior diameter of the shaft, and we do not see that either the semidiameter or the 20 minutes contrived by some will more nearly answer to the different part of the column.

## SECT. IV. *Of the Intercolumniation of the Orders*

Columns are either engaged or insulated, and when insulated or detached from the wall they are either very near, or at a considerable distance from it. When they are placed at a considerable distance from the wall, they are

\* In massive buildings, a more heavy entablature may be used, as was customary amongst the ancients. They divided the whole height assigned to the base, shaft, capital, and entablature, into four equal parts, and gave one to the entablature. The profiles of Vignola and Palladio have thus proportioned.

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destined to support the entablature, and their distance from each other should be consistent both with their real and apparent solidity. Engaged columns are attached to the wall, and are not limited in their intercolumniations, as they depend on the breadth of the arches, doors, windows, niches, or other decorations placed in them.

The ancients used five different species of intercolumniations, which, according to Vitruvius and Palladio, are as follows —

The pycnostyle, of which the interval is one and a half of the inferior diameter of the column.

The systyle, whose interval or space is two diameters.

The eustyle, two diameters and a quarter.

The diastyle, three diameters — and

The aræostyle, four diameters.

The three first of these were used by the Grecians, in the Doric, Ionic, and Corinthian orders, but the distances of the triglyphs of the Doric determined the intercolumniations of that order, which we shall describe in its place.

The ancient Romans preferred the eustyle in most cases, as being the best medium of the too little and too great intervals of columns, but in their Tuscan works, they used a space equal to four and sometimes six diameters, which intercolumniation was admissible in this order, since the architrave was usually formed of some kind of timber, when the other parts of the entablature were of stone. Palladio says, this intercolumniation of the Tuscan order was adapted to farm houses and other rustic works, as it afforded a passage for carts, and was attended with the least expence. In structures built entirely of stone, they, however, used a shorter interval, more suitable to the length of their marble blocks, and more agreeable to the ponderous fabric which they occasionally supported, for which reason the diastyle and eustyle modes were sometimes applied to this order. The moderns have indeed adopted these two as their general rule, and apply them to every order except the Doric. The aræostyle, however, is sometimes, by a modern contrivance authorised by a few examples of the ancients, introduced in porticoes and peristyles. This mode of the aræostyle is from Perrault, and is managed by placing two columns together at the angles, so close as to admit the two capitals nearly into contact. This manner, which is termed grouping, takes off from the excessive width of this kind of interval, whilst it adds to it both real and apparent strength, as is exemplified in St. Paul's church in London, and in the palace of the Louvre at Paris.

## Sect V Of Arches and their Ornaments

Arches are not so magnificent as colonnades, but they are more solid and less expensive. They are proper for triumphal entrances, gates of cities, of palaces, of gardens, and of parks, and, in general, for all openings that require an extraordinary breadth.

There are various manners of adorning

arches. Sometimes their piers are rusticated, sometimes they are adorned with pilasters, termini, or caryatides, and sometimes they are made sufficiently broad to admit niches or windows. The circular part of the arch is either surrounded with rustic key-stones, or with an archivolt enriched with mouldings, which, in the middle, is sometimes interrupted by a console, or mask, serving at the same time as a key to the arch, and as a support to the architrave of the order. The archivolt is sometimes supported by an impost, at the head of the pier, and at others by columns placed on each side of it, with a regular entablature, or architrave and cornice. There are likewise instances of arcades without piers, the arches being turned on single columns as in the temple of Faunus at Rome, &c. But this practice ought to be seldom imitated, as it is neither solid nor handsome.

The void or aperture of arches should never be higher, nor much lower, than double their breadth, the breadth of the pier should seldom exceed two thirds, nor be less than one-third of the breadth of the arch, and the angular pier ought to be broader than the others, by one half, one-third, or one-fourth. The impost should not be more than one-seventh, nor less than one-ninth of the aperture, and the archivolt must not be more than one-eighth, nor less than one-tenth of it. The breadth of the console must, at the bottom, be equal to that of the archivolt, and its sides must be drawn from the centre of the arch. The length of it must not be less than one and a half of its smallest breadth, nor more than double. The thickness of the pier depends on the breadth of the portico, for it must be strong enough to resist the pressure of its vault. But with regard to the beauty of the building, it should not be less than one-quarter of the breadth of the arch, nor more than one-third. These are the general dimensions of arches.

The proportions peculiar to the Tuscan arch, of which we have given an example, without pedestals, are as follows. In height, their aperture is 7 diameters and a quarter, in width 4, and from centre to centre of the columns, 6 diameters. According to the preceding remarks, the archivolt and imposts are half a diameter, and from the top of the archivolt to the underside of the architrave should not be less than 15 minutes. The breadth of the key-stone at the bottom is equal to its archivolt, and its spreading sides are determined by lines drawn from the centre of the arch, as is shewn in the plate. The plinth is one diameter in height, and the proportions of the column and entablature are the same with the Tuscan profile. For the proportions of the moulding of the archivolt and imposts, (see pl. 17.)

The Tuscan arch with pedestals is in width 4 and a half, and in height 8 diameters and a quarter, and from centre to centre of each pier is 6 and three quarters. In every other particular they are subject to the preceding rules.

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## Sect. VI *Of the Origin, Character, Use, and Proportions of the Doric Order*

This order owed its name to the Dorians, a people who inhabited one of the Grecian districts, and from whom it doubtless received the proportions and derived most of the parts by which it has been distinguished from orders of later date.

The Doric, as to its character, is by architects considered grave, robust, and of masculine aspect: hence it is figuratively termed the Herculean order.

The ancients employed this order in their temples dedicated to Juno, Minerva, Mars, and Hercules, whose grave and heroic dispositions suited well the solemn character of this order. It may be properly used in colonnades, porticos, halls, gates of cities, and public buildings erected in memory of heroes or famous personages. In most of the antiques, the Doric column is executed without a base. Vitruvius indeed makes it without one, the base, according to him, having been first employed in the Ionic order, in imitation of the sandals worn on women's feet. Scamozzi blames this practice, and most of the moderns are of his way of thinking. In conformity to the arguments of Leclerc, and agreeably to the practice of Palladio and of our modern architects, we have introduced an attic base to this order, yet, in ornamental temples, for gardens, &c. we are decidedly of opinion, that the Grecian style should be copied strictly and preserved chaste, according to the remains of antiquity, as discovered by both ancient and modern architects, who have with great diligence and expence explored their ruinous pilcs, to obtain accurate measurements of the several parts, particularly our countryman, James Stuart, esq. who, in three folio volumes, has presented to public view the antiquities of Athens, in which we have a clear display of pure Grecian architecture. In these we see, as well as in other works, that the Doric column was without a base, but its shafts decorated with a number of channellings or flutings peculiar to itself: for in the other orders, an interval or fillet is introduced between each fluting, but in this it is otherwise. Hence Scamozzi's censure that this manner of fluting is imperfect, in consequence of the projecting angles which separate each flute, which renders the shaft tender and more subject to decay. The force of this objection however will be greatly abated, when it is considered that these flutings are shallow, having their centre from the summit of an equilateral triangle, whose sides are equal to the width of the flute, consequently, it is little more than one quarter of the depth of the other kinds of flutings which are perfect semicircles.

The other members which mark the peculiar feature of the order, are the triglyph and mutule. The mutules are considered as a copy or imitation of the primitive huts, whose beams are seen to project under the roof, but the triglyph is

thought by some to be emblematical of the use of the first temple erected according to this order, which was dedicated to Apollo, to whose harp the triglyph bears some sort of resemblance. The metope, or spaces between the triglyphs, have been variously enriched. Palladio has introduced oxen skulls, with lighted torches hanging from each horn, and placed alternately with pateras, expressions of the sacrificial offerings performed to the heathen deities.

Other ornaments may, however, be introduced with propriety, both in public and private buildings. In the latter, crests and badges of dignity, heads, vases, or pateras, encircled with garlands of oak or laurel, are very suitable, in military structures, heads of Mars, Medusa, or the Furies, may be admitted.

Of the principal parts which compose this order, the following are the proportions. The whole height of the entire order is divided into five equal parts, one of which is the height of the pedestal, and the remaining four, which are assigned to the column and entablature, are likewise to be divided into five. One of these belongs to the entablature, and the remaining four being divided into eight equal parts, one of them will be the inferior diameter of the column. Or we may express it thus. The whole height of the order, including its pedestal, is twelve modules and a half, reckoning the module a whole diameter. The pedestal is two and a half, the base, shaft, and capital, eight, and the whole entablature two modules. Dividing the large diameter into sixty equal parts, called minutes, thirty are given to the base, thirty to the capital, thirty to the architrave, forty five to the metope, and forty-five to the height of the cornice, including the upper fillet or capital of the triglyph. In this order, when the mutules are introduced in the entablature, as in the example referred to, one module is assigned for the projection of the cornice, which in this respect exceeds any of the other orders. The projection of the mutules is equal to their width, being thirty minutes: the width of the triglyphs is exactly the same, and their distance from each other equal to the height of the metope, which, by this division, forms a perfect square. The sides of the channels of the triglyphs are at right angles with each other. The soffit of the mutule, and that of the corona, are frequently ornamented, the former with conical drops similar to those under the triglyphs, and the latter with roses in square and lozenge compartments. The proportions of the smaller parts, and of the several mouldings which compose the whole, must in this, and in every other order, be learned from their respective profiles.

## Sect. VII *Of the Intercolumniation and Arches of the Doric Order*

The intercolumniation of this order is often attended with peculiar difficulty, arising from the strict regard that is ever paid to the due width of the triglyph, and the perfectly square

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form of the metopes, or their intervals Besides, that it is absolutely requisite, that a triglyph should be placed exactly over the centre of every column For these reasons, the mutules and triglyphs have been omitted in capital works, both ancient and modern, as in the Coliseum at Rome, and the Royal Hospital at Greenwich

Palladio has, however, given one instance of an ancient temple with angular triglyphs in his structure, which he terms the Temple of Piety, is mentioned by Vitruvius, with an eye to the difficulty occasioned by the triglyphs being thus placed, which reduces the intercolumniation of the two angular columns to one diameter and a quarter, which is less than the pycnostyle The next intercolumniation is still greater, approaching nearly to the pierostyle, as is evidently necessary to bring the triglyph over the centre of the third column from the angle The next, which is the centre intercolumniation, and faces the entrance of the temple, is rather more than eustyle, or two diameters and a quarter, and has, in the metopes, ditriglyph But the intervals between the triglyphs are much too narrow for their height, so as to produce an unfavourable effect The other spaces are monotriglyph, and are perfect The regular intercolumniation of the Doric order is the monotriglyph, or pycnostyle, which admits of one between two columns The ditriglyph, or eustyle, admits two, and the aræostyle is tritriglyph, or consisting of three, but the most perfect of these is the ditriglyph

When the capitals and bases of coupled Doric columns have their proper projections, and are at any distance from each other, the metope between them will be rather too wide, but that may be avoided by confining the projections, or making the triglyph one minute more than it really should be, and placing or removing its centre a minute within the axis of the column which trifling differences will not be perceived without the nicest examination

Doric arches, without pedestals (see pl 17), are seven diameters and three-fourths high, and in width four diameters and 15 minutes The piers are two modules in front, and in thickness one module 22½ minutes, or in proportion to their distance from the wall From centre to centre of each pier is 6 diameters and 15 minutes Arches of this order, with pedestals, have their apertures, in height, 9 diameters and 30 minutes, and in their width, 5 diameters 16 minutes The piers are 2 diameters 15 minutes wide in front, and from centre to centre of each, is 7 diameters and 15 minutes

SECT VIII *Of the Origin, Character, Use, and Proportions of the Ionic Order, with the Manner of describing its Volute*

The Ionic order owes its invention to the people of Ionia, who inhabited a Grecian district and is said to have been first employed in the decorations of the temple of Diana, at Ephesus

The Ionic column is more slender and graceful than the Doric Its ornaments are truly elegant, being in a style of composition between the richness of the Corinthian and the plainness of the Tuscan orders Its general appearance being simple, yet graceful and majestic, in figurative language, it has been compared to a sedate matron, in decent, rather than in rich attire

In forming the profile, and in adjusting the proportions of this order, most of the modern architects have, in a great degree, imitated the columns, capitals, and entablatures, in the temple of Manly Fortune and Concord, in the theatre of Marcellus, and the Coliseum at Rome Amongst the ancients, the form of the Ionic profile appears to have been more positively determined than that of any other order. for in all the antiques at Rome, except in the temple of Concord, it is exactly the same

The proportions of the principal parts of the Ionic column are as follow The height of the entire order is divided into five equal parts One of these parts is assigned to the height of the pedestal, and the remaining four are divided into six, for the column and entablature One of these is appropriated to the entablature, and the remaining four are for the column, including its capital and base These four being divided into equal parts, one is assigned for the inferior diameter The cornice is 44 minutes in height, and its projection the same The drip in the underside of the corona is channelled out one minute deep, and two minutes from the front, and before the cyma reversa, one minute The shaft of the column is sometimes fluted and sometimes plain Twenty, or twenty-four, are the number of flutes allotted, not only to this, but to every other order In general, however, 24 are preferable The plan of the flutes may be rather more than a semicircle, as they will then appear more distinct The fillets, or intervals between them, must not be broader than one-third of the flutes, nor less than one-fourth and it should farther be observed, that in the capital of rich compositions over each flute, is placed an oval or egg For the other particulars, recourse must be had to the plate In exterior works, when the building is large, the entablature may be enlarged to one fourth of the whole height of the column without its pedestal, as was sometimes practised by the ancients Palladio, however, makes no distinction of this nature, but allows only one fifth part of the height of the column in all cases

The volute, which is a very principal member of this column, is executed in various forms The Grecian volute has a double fillet winding round to its eye, which, by the partings or spaces between, produces a variety of light and shade, and affords to the whole convolution additional grace and beauty.

The manner of drawing the volute, according to Goldman's method, is as follows (see pl 16) Draw the perpendicular F A, termed the cathetus, and make its length equal to 15 minutes On the centre describe a circle,



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whose diameter is  $3\frac{1}{2}$  minutes. Draw next a geometrical square, having its sides equal to the radius of the circle, as 1, 2, 3, 4. From the angles 2, 3, draw diagonals to the centre at C. Divide the side of the square 1, 4, into 6 equal parts, as at 5, 9, 12, 8, and from these points draw parallel lines to the diagonals, as shewn in the eye of the volute, whence will be obtained 12 centres, by which every arch composing the volute may be accurately drawn, each of them coinciding with the other. Thus, on the centre 1, fix one foot of the compass, and extend the other to F, and with this opening, describe the arch F G. On the centre 2, with the other foot extended to G, describe the arch G H. On the centre 3, extending it to H, describe the arch H I, and on the fourth centre describe the arch I K, which completes one revolution. Proceed then in the same way, to the centres 5, 6, 7, 8, for the second revolution, and to 9, 10, 11, 12, for the third revolution. Thus it appears, that the whole convolution consists of 12 quadrants of circles of so many different diameters.

To graduate the fillet, construct a triangle at O, of which the side P A is equal to that part of the cathetus, contained from A to F, and the side V F, equal to half the side of the square in the eye of the volute a, C, 1. Draw then the line S T, at a distance from V F, equal to the breadth of the fillet at I S, which may be 2 minutes, or 1 and  $\frac{1}{16}$ ths. Take the pace S T, and place it each way from the centre of the volute, as from C to 3. Divide S T into three equal parts, as at 1, 2, 3, in the eye of the volute, and from these points draw parallel lines to the diagonals, which will find 12 new centres, and proceeding from one to the other, as was done in drawing the exterior contour, the regular diminution of the fillet may be accurately performed.

With respect to the intercolumniation of this and the succeeding order, what has been observed on the subject, in a former section, may suffice: and as to the arches peculiar to each order, all that is necessary, after what has been remarked on the two preceding orders, is a careful inspection of the plates, where we have marked the peculiar proportions in so many whole diameters, or parts of a diameter or module.

## Sect IX. Of the Origin, Character, Use, and Proportions, of the Composite Order.

This order had its origin amongst the ancient Romans, and Serlio is said to have been its inventor. In its style of composition it partakes of the Ionic and Corinthian orders, but mostly of the latter, particularly in the leaves of its capital. Some architects, however, do not incline to speak well of this order, merely on the principle of its being a composition from the others. But this, in itself, is not a sufficient ground for objection, since the same may be said of the Tuscan order, which is a composition from the rude state of the Doric. On the other hand, we freely acknowledge, that the Composite order is so complete an

imitation of the Corinthian, that at first sight, the little difference between them will even deceive the eye of a tolerable judge. This at once pronounces the composition at least defective, if not bad, for why are two orders of architecture scarcely to be discriminated, but by the eye of a skillful architect?

The general proportions of this order are as follow. The height of the entire order is divided into five equal parts, one of which is appropriated for the height of the pedestal, and the remaining four, for the column and entablature. These four parts being again divided into six, one is for the entablature, and the remaining five, for the height of the column, including its base and capital. The height of the column is divided into 10 equal parts, one of which is given to the inferior diameter. The base is 30 minutes, the capital 70 in height, adorned with acanthus leaves, and volutes, drawn by the same method as those of the Ionic: and the plin of the capital is the same with that of the Corinthian order.

The soffit of the corona is divided into square compartments cut out of the solid, decorated with roses whose relief must not project more than the borders which inclose them. In rich compositions, the soffits of the modillions are also ornamented, but their relief is not to exceed the horizontal surface, which would greatly injure the effect of the modillion, and render the appearance of the profile of the entablature less pleasing.

## Sect X. Of the Origin, Character, Use, and Proportions, of the Corinthian Order.

The city of Corinth gave birth to this finest of all architectural compositions, in which we see proportion, simplicity, elegance, and richness, combined to a degree almost exceeding imagination, and which we are persuaded will never be surpassed, whilst architecture has an existence. This order is, and will continue to be, a perpetual memorial of the exquisite taste and genius of an ancient Grecian people. Ser-mozzi calls it the virginal order, an epithet truly characteristic of the delicacy and tenderness of composition apparent in the whole. Conformably to the whole of its character, the ancients employed it in works of magnificence, grandeur, and delicacy. It obtained a place in palaces, public squares, banqueting rooms, theatres, and the apartments of young ladies. It was also generally used in temples dedicated to female deities, and sometimes in those of Jupiter, Mars, and Mercury.

The most perfect model of the Corinthian order is generally allowed to be shewn in the three columns in the Campo Vaccino at Rome: the remains, as it is supposed, of the temple of Jupiter Stator.

The base of the column may be either Attic or Corinthian, since both are beautiful. The entablature is generally much enriched, particularly by the ancients, who introduced in the frieze representations of various figures (see pl. 4.) A very full display of the cyma may be found in Stuart's Antiquities of Athens.

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When the entablature is thus enriched, the columns are fluted, and the flutings may be filled with cablings, one third, from the bottom, of the whole height of the shaft, as in the inside of the Pantheon. In most of the antiquities at Rome, the capital of this order is decorated with olive-leaves, the acanthus being seldom employed but in the Composite.

The general proportions of this order are as follow. The whole height of the entire order is divided into five equal parts, and one is given for the height of the pedestal. The remaining four are divided into six equal parts, one is assigned for the entablature and the remaining five are assigned to the height of the column including its base and capital, which are again divided into equal parts, one of which is for the inferior diameter. The base is 30 minutes, and the capital 70, in height. The cornice is 48 minutes, both in height and projection.

The soffit of the corona is worked in square compartments, as in the Composite, but the soffit of the modillion is ornamented with an olive-leaf, the same as in the capital. The breadth of the modillion is 10 minutes and a half, and the space between each modillion twice their width.

The abacus of the capital is sometimes plain, and sometimes fluted, as in this profile. In some capitals the volutes rise higher than the underside of the abacus, but the capital looks best when they are bounded by its under surface.

To determine the plan of a capital according to the ancients, draw a geometrical square whose sides are one diameter and a half. To this square draw diagonals, and on these, place from the centre, or their intersection, a space equal to one diameter, through which point lines being drawn at right angles with the diagonals, will determine both the projection and thickness of the volutes. For the curvature of the abacus, extend the compasses from one angle to the other of the side of the abacus, and with this opening, intersect two arches described from the angles of each horn of the abacus, and the point of intersection will be the centre, by which, with the same opening of the compasses, the concavity of the abacus will be accurately drawn.

## Sect. XI Of Pilasters in general

Pilasters differ from columns only in their plan, which is a square as that of columns is round. Their bases, capitals, and entablatures, have the same parts, with the same heights and projections as those of columns: they are also distinguished in the same manner, by the names of Tuscan, Doric, Ionic, Corinthian, and Composite.

The column is undoubtedly more perfect than the pilaster. However, they may be employed with great propriety on many occasions. Some authors declaim against pilasters, because, according to them, they do not admit of diminution. But this is a mistake, there are many instances, in the remains of antiquity, of their being diminished. Scamozzi always gave his

pilasters the same diminution as his columns. Palladio and Inigo Jones have likewise diminished them in many of their buildings.

Pilasters are employed in churches, galleries, halls, and other interior decorations, to save room, for, as they seldom project beyond the solid wall above one quarter of their diameter, they do not occupy near so much space as columns. They are likewise used in exterior decorations, sometimes alone, instead of columns, on account of their being less expensive, and sometimes they accompany columns, being placed behind them to support the architraves, where they enter the building, as in the Pantheon at Rome, or in the same line with them, to fortify the angles, as in the Portico of Septimius.

When pilasters are used alone, they should project one quarter of their diameter beyond the wall. When placed behind columns, especially if they be very near them, they need not project above one eighth of their diameter. But, when placed on a line with columns, their projection must be regulated by that of the columns, and, consequently, it can never be less than a semidiameter, even when the columns are engaged as much as possible.

The shafts of pilasters are frequently adorned with flutings, in the same manner as those of columns: the plan of which may be a trifle more than a semicircle: their number must be seven on each face, which makes them nearly of the same size with those of columns. The intervals or fillets, must either be one third or one fourth of the fluting in breadth.

The capitals of pilasters are profiled nearly in the same manner as those of columns.

## Sect. XII Of Attics

These very properly follow the pilasters, being nothing more than square pillars with their cornices. They had their origin in Athens, where it was for many ages a rule in building to conceal the roof. For this purpose, nothing served so well as a kind of low or little order ranged in a continued line, singly, or with the interruption of balusters, which, rising above the rest of the work and before the roof hid it perfectly, and placed something agreeable in view. The place of attics, therefore, is at the uppermost extremity of a building, to which they serve as a crown, or very properly make a finishing for the other orders when they have been used in the structure. They must never stand under any thing except such ornaments as are placed at the very top. These attics should never exceed in height one third of the height of the order on which they are placed, nor be less than one quarter of it. The base, dye, and cornice, of which they are composed, may bear the same proportions to each other as those of pedestals do, and the base and cornice may be composed of the same mouldings as those pedestals. Sometimes the attic is continued throughout; at others, it projects, and forms a pilaster over each column of the order. The breadth of this pilaster is seldom made narrower than the upper diameter

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of the column below it, and never broader: its projection may be equal to one quarter of its breadth.

## Sect XIII Of Pediments

Pediments, among the Romans, were used only as coverings to their sacred buildings, till *Cæsar* obtained leave to cover his house with a pointed roof, after the manner of temples. In the remains of antiquity we meet with two kinds of pediments, the triangular and the circular. The former of these are promiscuously applied to cover small or large bodies but the latter, being of a heavier figure, are never used but as coverings to doors, niches, windows, or gates.

As a pediment represents the roof, it should never be employed but as a finishing to the whole composition.

The ancients introduced but few pediments into their buildings, usually contenting themselves with a single one to adorn the middle or principal part. But some of the moderns, and particularly the Italians, have been so immoderately fond of them, that their buildings frequently consist of scarcely any thing else.

The girdle being a necessary part in the construction of a roof, it is an impropriety to interrupt the horizontal entablature of a pediment, by which it is represented, to make room for a niche, an arch, or a window.

In regular architecture, no other form of pediments can be admitted besides the triangular and circular. Both of them are beautiful, and when a considerable number of pediments are introduced, and when a range of windows are adorned with them, these two figures may be used alternately, as in the niches of the *Parthenon*, and in those of the temple of *Drina* at *Nismes*.

The proportion of pediments depends upon their size, for the same proportions will not do in all cases.

When the base of the pediment is short, its height must be increased, and when the pediment is long, the height must be diminished. The best proportion for the height is from one-fifth to one-fourth of the base, according to the extent of the pediment, and the character of the body it covers. The materials of the roof must also be attended to, for if it be covered with tiles, it will be necessary to raise it more than one quarter of the base, as was the custom of the ancients in their *Tuscan* temples.

The tympan is always on a line with the front of the frieze, and when large, admits of various ornaments.

## Sect XIV Of Gates, Doors, and Piers

There are two kinds of entrances, viz doors and gates. The former serve only for the passage of persons on foot, but the latter likewise admit horses and carriages. Doors are used as entrances to churches and other public buildings, to common dwelling houses, and apartments; and gates serve for inlets to cities, fortresses, parks, gardens, palaces, &c. The apertures of gates being always wide, they are

generally made in the form of an arch, that figure being the strongest. But doors, which are generally of small dimensions, are commonly parallelograms, and closed horizontally. The general proportion for the apertures, both of gates and doors, whether arched or square, is, that the height be about double the breadth.

The most common, and indeed almost the only ornaments for gates are the piers by which they are supported, and which were originally no more than bare posts into which the hinges of the gate were driven. Though this, however, is the only proper use of piers, it must be concealed as much as possible, and they must seem as if placed there only for ornament. As they are to be fixed to the wall before the house, so they must also be proportioned to it, and as they are to be seen in the same view with the front of the house, their correspondence with it is equally necessary. They are to be placed on a plinth, and something must be allowed by way of ornament and finishing at the top. All the luxuriance of fancy may be employed in the decoration of piers but it will be proper to observe this general rule, that the pier being an inferior building, it must never be richer than the front of the house. If, for instance, the front of the house is ornamented with columns of the *Doric* order, the *Ionic* must not be used in the piers, and it will be better to omit columns altogether, than to make use of the *Tuscan* order for piers in any case. If the *Ionic* or *Corinthian* orders are employed in the front of the house, the *Doric* or *Ionic* may be used with propriety in the piers. One piece of ornament is almost universal in piers, namely, a niche with its seat, made as if for the convenience of weary travellers. On this account it will be proper to raise the columns on pedestals, because the continued moulding from their cap will be a good ornament under the niche. The base of the columns ought always to be attic.

Inside-doors, however small the building may be, should never be narrower than two feet nine inches, nor should they ever, in private houses, exceed three feet six inches in breadth, which is more than sufficient to admit the bulkiest person. Their height should at least be six feet three or four inches, otherwise a tall person cannot pass without stooping. In churches, palaces, &c where there is a constant ingress and egress of people, the apertures must be larger. The smallest breadth that can be given to a gate is 14 or 16 feet, which is but just sufficient for the passage of a coach.

## Sect XV Of Niches and Statues

It has been the custom of every age to enrich different parts of buildings with representations of the human body. Thus the ancients adorned their temples, baths, theatres, &c with statues of their deities, heroes and legislators. The moderns still preserve the same custom, placing in their churches, palaces, &c statues of illustrious persons, and even groups composed of various figures, representing occurrences collected from history, fables, &c. Sometimes

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these statues or groups are detached, raised on pedestals, and placed contiguous to the walls of a building, or in the middle of a room, court, or public square. But they are most frequently placed in cavities made in the walls, called niches. Of these there are two sorts; the one formed like an arch in its elevation, and semicircular or semielliptical in its plan, the other is a parallelogram both in its plan and elevation.

The proportion of both these niches depends on the characters of the statues, or the general form of the groups placed in them. The lowest are at least a double square in height; and the highest never exceed  $2\frac{1}{2}$  of their breadth.

With regard to the manner of decorating them, when they are alone in a composition, they are generally inclosed in a pannel, formed and proportioned like the aperture of a window, and adorned in the same manner. In this case the niche is carried quite down to the bottom, but on the sides and at the top, a small space is left between the niche and the architrave of the pannel. And when niches are intermixed with windows, they may be adorned in the same manner with the windows, provided the ornaments be of the same figure and dimensions with those of the windows.

The size of the statue depends on the dimensions of the niches. They should neither be so large as to have the appearance of being rammed into the niches, as in Santa Maria Majora at Rome, nor so narrow as to seem lost in them, as in the Pantheon. The distance between the outline of the statue and side of the niche should never be less than one-third of a head, nor more than one-half whether the niche be square or arched, and when it is square, the distance from the top of the head to the ceiling of the niche should not be greater than the distance on the sides. Statues are generally raised on a plinth, the height of which may be from one-third to one-half of a head, and sometimes where the niches are large, the statues may be raised on small pedestals.

The character of the statue should always correspond with the character of the architecture with which it is surrounded. Thus, if the order be Doric, Hercules, Jupiter, Mars, Æsculapius, and all male statues, representing beings of a robust and grave nature, may be introduced, if Ionic, then Apollo, Bacchus, &c. and if Corinthian, Venus, Flora, and others of a delicate nature, should be employed.

## Sect XVI Of Chimney-Pieces

The size of the chimney must be regulated by the dimensions of the room where it is placed. In the smallest apartments, the breadth of the aperture should never be less than three feet, or three feet six inches. In rooms from 20 to 24 feet square, or of equal superficial dimensions, it may be from 4 to  $4\frac{1}{2}$  feet broad, in those of 24 to 27, from  $4\frac{1}{2}$  to 5, and in such as exceed these dimensions, the aperture may even be extended to  $5\frac{1}{2}$  or 6 feet.

The chimney should always be situated so as to be immediately seen by those who enter

the room. The middle of the partition-wall is the most proper place in halls, saloons, and other rooms of passage, but in drawing-rooms, dressing-rooms, and the like, the middle of the back-wall is the best situation. In bed-rooms, the chimney is always in the middle of one of the partition-walls and in closets and other very small places, to save room, it is put in a corner. Wherever two chimneys are used in the same room, they should be placed either directly facing each other, if in different walls, or at equal distances from the centre of the wall in which they both are.

The proportion of the apertures of chimney-pieces of a moderate size is generally a perfect square, in small ones it is a trifle higher, and in large ones a trifle lower. Their ornaments consist in architraves, friezes, cornices, columns, pilasters, termini, caryatides, consoles, and all kinds of ornaments of sculpture, representing animals and vegetables, &c. likewise vases, chalices, trophies of arms, &c. In designing them regard must be had to the nature of the place where they are to be employed. Such as are intended for halls, saloons, guard-rooms, galleries and other large places, must be composed of large parts, few in number, of distinct and simple forms, and having a bold relief, but chimney-pieces for drawing rooms, dressing-rooms, &c. may be of a more delicate and complicated nature.

## Sect XVII Of Staircases

Staircases are the means of ascending to the different stories of a building, and ought to be so constructed as to make the ascent safe, agreeable, and easy.

To fix on a proper and advantageous situation for a staircase is often attended with difficulty, but without which the internal convenience and beauty of a house will be much injured. Palladio is of opinion, that the entrance to a staircase ought to be situated so as the principal parts of a building may be seen before we ascend the steps and upon this principle it is observable, that a more easy access is gained to the principal apartments on the ground-floor.

To render stairs easy of ascent, the height of a step ought not to exceed seven inches, nor in any case to be less than four, but six inches is a general height. The breadth of the steps should not be less than 12 inches, if it can possibly be avoided, nor should they ever be more than 18, and to render our ascent free from the interruption of persons descending, their length should not exceed 12, nor be less than four feet, except in common and small buildings, whose area will not admit of a staircase of more than three feet.

That the ascent may be both safe and agreeable, it is requisite also to introduce some convenient aperture for light, which ought to be as nearly opposite to our first entrance to the stairs, as the nature of the building will admit of. An equal distribution of light to each flight of stairs ought to be particularly regarded, for which reason, these apertures or windows

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are commonly placed at the landings or half-spaces, though sometimes the whole is lighted from a dome.

Staircases are of various kinds, whose plans are circular. Some wind round a newel in the middle, and the risers of the steps are straight, and sometimes curved. Others have their plan circular, but form a well in the centre. The same may be observed of those whose plans are elliptical: the most common, however, are those whose plans are a square or parallelogram. The ancients paid a superstitious regard to an odd number in their flights of steps, as 3, 5, 7, &c. in order that in their ascent, they might begin and finish with the right foot. Palladio, therefore, allows to the staircase of a dwelling-house 11 or 13 steps to each flight.

When a staircase winds round a newel or column, whether its plan be circular or elliptical, the diameter being divided into three equal parts, two are set apart for the steps, and one for the column. But in circular or elliptical staircases that are open, or which form a well in the middle, the diameter is divided into four equal parts, two for the steps, and two for the open space or well in the centre. Modern staircases, however, have often a kind of well or mixed form, straight on each side, and circular at the returns of each flight. The openings of these wells are various in width, but seldom exceed 18 or 20 inches.

### Sect XVIII *Of Balustrades*

Balustrades are sometimes of real use in buildings, and at other times they are only ornamental. Such are intended for use, as when they are employed in staircases, before windows, or to enclose terraces, &c. must always be nearly of the same height, never exceeding three feet and a half, nor ever less than three. But those that are principally designed for ornament, as when they finish a building, should be proportioned to the architecture they accompany, and their height ought never to exceed four-fifths of the height of the entablature on which they are placed: nor should it ever be less than two-thirds thereof, without counting the zoccolo, or plinth, the height of which must be sufficient to leave the whole balustrade exposed to view.

The best proportion for balustrades is to divide the whole given height into thirteen equal parts; eight of these for the height of the balustrade, three for the base, and two for the cornice or rail: or into fourteen (if it be required to make the balustrade less,) giving eight parts to the balustrade, four to the base, and two to the rail. One of these parts may be called a module; and being divided into nine minutes, may serve to determine the dimensions of the particular members.

In balustrades, the distance between two balusters should not exceed half the diameter of the baluster measured in its thickest part, nor be less than one-third of it.

The breadth of the pedestals, when they are placed on columns or pilasters, is regulated by

them; the base never being made broader than the top of the shaft, nor much narrower, and when there are neither columns nor pilasters on the front, the base should not be much lower than a square, and seldom higher. On stairs, or any other inclined planes, the same proportions are to be observed as on horizontal ones.

### Sect XIX *Of Orders upon Orders, and of Basements*

We have already, in speaking of the Composite order, described the regular succession that should be observed, from the ground upwards, and therefore we have now only to observe, that in placing columns upon one another, the axis of every column should be perpendicular to each other, at least they must be so in the front view. With regard to the proportions of columns placed above each other, Scamozzi's rule, that the lower diameter of the superior column ought constantly to be equal to the upper diameter of the inferior, is universally esteemed the best, and gives all the columns the appearance of one long tapering tree cut into so many pieces.

In this country, however, we have few examples of more than two stories of columns in the same elevation, for when there are three, it is impossible to avoid some striking inconsistencies, or to preserve the character of each order in its intercolumnial decorations: since the intervals of the upper columns must become too wide, and would neither appear graceful nor solid.

But, instead of employing several orders, one above another, the ground floor is, in some cases, made in the form of a basement, on which the order that decorates the principal story is placed. The proportions of these basements are not fixed, but depend on the nature of the rooms on the ground floor. In some structures, the height of the basement is equal to that of the first order. In some buildings, it does not exceed two-thirds of the order, and in others is only half its height. Basements should never be higher than the columns they support, nor less than one-half of their height.

It is usual for basements to be decorated with rustics, whose height, including the joint, should be half a diameter of the order placed upon them. Their figures are from a square to a sesquialtera, and their joints may be either square or chamfered. The square joint is one-eighth of the height of the rustic, and in depth they are equal to their width, those that are chamfered must form a rectangle, and their joints are one-fourth of the width of the flat part of the rustic.

### Sect XX *Of Roofs and their Coverings*

Before we can proceed in the business of roofing, a plan of the building to be covered should be made, by which we may be able to ascertain the lengths of the various timbers required for the whole. The particular kinds of covering practised in England are lead, pantiles, plain tiles, and slates. Coverings of lead

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are doubtless the best and most durable of any other; but on account of their expence they are seldom chosen, except for magnificent buildings. Lead is most generally used on roofs of a very flat pitch, where any other sort of covering would not be safe. The pitch or perpendicular height of such roofs is about  $\frac{2}{3}$ ths of the width of the building, or rather under what is termed pediment pitch. Lead however is now mostly used for perfectly flat coverings. Pantile coverings may also be used to low roofs, but their general pitch ought to be about  $\frac{3}{8}$ ths of the width of the building. Coverings of plain tiles and slates are generally allowed the highest pitch, because when they are laid on low roofs, the rain will more easily find its way between them. These ought to have a pitch, the length of whose rafters is  $\frac{3}{4}$ ths of their girder, or at least, the sides of the roof ought to be at right angles with each other. There are also various kinds of circular roofs, but those most generally in use are formed in the manner now described, having square or oblong plans, and timber frames.

When beams exceed 20 feet in extent, they should be trussed up in one or more places, as may be required. Beams should never exceed 15 feet in bearing, nor rafters more than 10 feet, and especially in roofs of very low pitch, whose coverings have a much greater pressure on their rafters, than those of higher pitches, and which may therefore exceed 10 feet.

If the length of a beam of fir be 30 feet, its scantlings may be 7 inches deep and 6 inches thick.

If 45	9	7
60	10	8½
75	10½	10
90	12	10½

If the length of a principal rafter be 24 feet, its scantlings may be

	6 inches deep and 5 in thickness	
If 36	7	6
41	9	7
60	10	7½
72	10	9

Rafters of these dimensions are generally made about one inch larger at the bottom both in depth and thickness, which strengthens the roof by admitting larger tenons into the principal beams, and by becoming lighter at the top.

If the rafters be small, as 8 feet in length, their scantlings may be 4½ inches by 3 inches thick.

If 10	5	3
12	6	3

## Sect XXI Of Cielings

Cielings in churches and temples may be considered as the interior coverings of their roofs, as there is nothing between them but the necessary framing by which the whole is supported. For dwelling-houses the simplest and most common sort are those which are flat. These are generally adorned with principal compartments, surrounded with mouldings, either let into the ceiling or projecting from it. Their ornaments and mouldings do not require a bold relief; but being near the

eye, they must be finished with neatness and taste.

Coved cielings are certainly more beautiful than flat ones; but their execution is attended with more expence. They are used promiscuously in large and small rooms, and occupy from one-fifth to one-third of the height of the room. But where the architect is at liberty to proportion the height of the room to its superficial dimensions, the most eligible proportion for the cove is one-fourth of the whole height of the room. The figure of the cove is commonly either a quadrant of a circle or of an ellipsis, taking its rise a little above the cornice, and finishing at the border round the great pannel in the center. The border projects somewhat beyond the coves on the outside; and on the side towards the pannel, it is generally made of sufficient depth to admit the ornaments of an architrave.

When the profiles of rooms are gilt, the cielings ought likewise to be gilt. The usual method is to gild all the ornaments, and leave the ground white, pearl-colour, light blue, or any other that may be proper to set off the gilding to advantage.

Historical and other paintings are often introduced with good effect in the centre and angular compartments of large cielings, and of late in invention of painted silk and satin in various ornaments from the antique has been introduced, to adorn the profiles or walls of rooms. These are inclosed in pannels, pilasters, and tablets, according to their situation, and, when they have suitable gilt mouldings, produce a very pleasing and splendid effect.

## OF THE CONSTRUCTION AND PRINCIPLES NECESSARY TO BE OBSERVED IN THE ERECTION OF BUILDINGS IN GENERAL

### Sect I Of the Principles necessary in erecting a Building

Having now finished our observations on the several detached articles necessary to complete the composition of different structures, we shall take some notice of the principles essential to the raising of buildings in general.

The rules of building require, that in a whole fabric judiciously and elegantly erected, there should be solidity, convenience, and beauty, to which, according to the taste of some of the most refined masters, are added, order, disposition, proportion, decorum, and economy. These eight particulars are considered by the most skilful architects as absolutely requisite in the planning, erecting, and finishing an entire fabric.

Solidity implies the choice of a good foundation, proper materials to work with, as well as their judicious application. Convenience demands such a disposition of the various parts of a structure, that they may not crowd and embarrass each other, or appear disagreeable to a spectator. Beauty, of which we have treated in another place, is that engaging form, and pleasing appearance, which captivates at one



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glance the eye of the observer. Order gives each part of the building a proportionate extent; such as is adapted to the magnitude of the whole. Disposition is the due ranging and agreeable union of all the parts, including a proper and convenient arrangement of the various apartments of the whole fabric. Proportion is the relation that the whole work has to its constituent parts, and which each part has to the complete idea of the whole, for in buildings that are perfect in their kind, from any particular part we may form a tolerable judgment of the whole. Decorum consists in making the whole aspect of the fabric so correct, that nothing shall appear, but what is founded on the principles of reason, geometry, and delicacy of judgment. Design, in the limited sense here used, is the choice of one situation in preference to another, which we may conceive improper for the kind of building which we are about to erect. The regard we have to the nature of places, from an inherent taste natural to mankind, makes us pitch upon different prospects or views for different parts of an edifice. Economy instructs the architect to have regard to the expence of his whole design, which will be greatly effected by a choice of such materials as are not only proper for his purpose, but of the cheapest of the kind which are proper.

## Sect II *Of Proper and Sure Foundations*

The best foundation is that which consists of gravel or stone, but, in order to know whether the inferior strata are sufficient for the support of the building, it will be advisable to sink wells at some little distance. By attending to what is thrown up in digging these, the architect will be acquainted with what lies under the stony or gravelly bed which on the surface promises so much security, and will know what measures to take.

But though a stony or gravelly bottom is undoubtedly the most sure and firm, where all is sound beneath, there is no kind of ground which may prove more fallacious, or occasion such terrible accidents. The reason of this is, that such kind of ground often contains absolute vacuities, nor is rock itself, though a foundation upon a rock is strong even to a proverb, free from danger of the same kind. Caverns are very frequent in rocky places; and should an heavy building be erected over one of these, it might suddenly fall down altogether. To guard against accidents of this kind, Palladio advises the throwing down great weights forcibly on the ground, and observing whether it sounds hollow, or shakes. He says, if a drum be placed on the suspected ground near to a vessel filled with water, a gentle stroke will not resound nor rattle the surface of the water, if the earth be solid; but, if it be hollow, the effects produced will very clearly shew it.

Where the foundation is gravel, it will be proper to examine the thickness of the stratum, and the qualities of those that lie under it, as they have appeared in digging. If the bed of gravel is thick, and the under strata of a sound

and firm kind, there needs no assistance, if otherwise we must have recourse to various methods in order to supply the defect.

In case of boggy earths, or unfirm sand, piling is one of the most common methods of securing a foundation; and, notwithstanding the natural disadvantages in such a case, piles, when properly executed, make one of the firmest and most secure foundations.

In foundations near the edge of waters, we should always be careful to sound to the very bottom, as many fatal accidents have happened from the ground being undermined by rivers. The same method is to be followed when the ground on which we build has been dug or wrought before. It ought never to be trusted in the condition in which it is left, but we must dig through it into the solid and unmoved ground, and some way even into that, according to the weight and size of the intended edifice.

Before the architect, however, begins to lay the foundation of the building, it will be proper to construct such drains as may be necessary for carrying off the rain, or other refuse water that would otherwise be collected and lodge about the house. In forming drains for carrying off this water, it will be necessary to make large allowances for the different quantities that may be collected at different times. It must also be considered, that water of this kind is always loaded with a vast quantity of sediment, which by continually falling to the bottom will be very apt to choke up the drain, especially at those places where there happen to be angles or corners in its course. The only method of preventing this is by means of certain cavities disposed at proper distances from one another. Into these the sediment will be collected, and they are for that reason called cesspools.

All drains ought to be arched over at top, and may be most conveniently built of brick. According to their different sizes, the following proportions of height and thickness may be observed. If the drain is 18 inches wide, the height of the walls may be one foot, and their thickness 9 inches, the bottom may be paved with brick laid flat-ways, and the arch turned 4 inches. If the drain be 22 inches wide, the side-walls are then to be one foot three inches in height, and the rest constructed as before. If it is 14 inches wide, the height of the walls may be 9 inches, and the sweep of the arch 4. A drain of a yard wide should have the same height, and the arch turned over it ought to be 9 inches thick. Upon the same principles and proportions may other drains of any size be constructed.

The sewers and drains being constructed in a manner proportioned to the size of the intended building, the architect may next proceed to lay the foundation of the walls. Here his first care must be, that the floor of the foundation be perfectly smooth and level. The Italians began with laying over it an even covering of strong oak plank, and upon that they lay, with the most exact care, the first course of the materials. Whether we take



this method, or begin upon the naked floor, all must be laid with the most exact truth by rule and line. When the board-plat is laid, a course of stone is the best first bed, and this is to be laid without mortar; for lime would make the wood decay, which otherwise, in a tolerably good soil, will last for ages.

The thickness of foundation-walls in general ought to be double that of the walls which they are to support. The looser the ground, the thicker the foundation-wall ought to be, and it will require the same addition also in proportion to what is to be raised upon it. The plane of the ground must be perfectly level, that the weight may press equally every-where for when it inclines more to one side than the other, the wall will split. The foundations must diminish as they rise, but the perpendicular is to be exactly kept in the upper and lower parts of the wall, and this caution ought to be observed all the way up with the same strictness. In some ground, the foundation may be arched, which will save materials and labour, at the same time that the superstructure has an equal security. This practice is peculiarly serviceable where the foundation is piled.

As the foundation-walls are to diminish in thickness, so are those also which are built upon them. This is necessary in order to save expence, but is not absolutely so to strengthen the wall, for this would be no less strong though it was continued all the way to the top of an equal thickness, provided the perpendicular was exactly kept. In common houses built of brick, the general diminution from the bottom to the top is one half the thickness at the bottom, the beginning is two bricks, then a brick and a half, and lastly one brick in thickness. In larger edifices, the walls must be made proportionally thicker, but the diminution is preserved much in the same manner. When stones are used, regard must be had to their nature, and the propriety of their figures for holding one another, and where the wall is to be composed of different materials, as stone and brick, the heaviest ought always to be placed undermost.

One farther particular respecting the strength of a plain wall must be observed, and that is, the fortifying its angles. This is best done with good stone on each side, which gives not only a great deal of strength, but a great deal of beauty. Pilasters properly applied afford great strength to walls. Their best distance is about every 2<sup>d</sup> feet, and they should rise five or six inches from the naked of the wall. The openings in a wall are all weakeners, and as the corners require to be the strongest parts, there should never be a window very near a corner. Properly, there should always be the breadth of the opening firm to the corner.

Along with the construction of walls, that of the chimneys must also be considered, for errors in the construction of these will render the most elegant buildings extremely disagreeable.

After the walls are finished, the roof is the

next consideration but concerning it very little can be said, only that its weight must be proportioned to the strength of the walls.

With regard to the floors they are most commonly made of wood, in which case, it will be necessary that it should be well seasoned by being kept a considerable time before it is used. The floors of the same story should all be perfectly on a level, not even a threshold rising above the rest and if in any part there is a room or closet whose floor is not perfectly level, it ought not to be left so, but raised to an equality with the rest, what is wanting of the true floor being supplied by a false one.

In mean houses, the floors may be made of clay, ox-blood, and a moderate portion of sharp sand. These three ingredients, beaten thoroughly together and well spread, make a firm good floor, and of a beautiful colour. In elegant houses, the floors of this kind are made of plaster of Paris, beaten and sifted, and mixed with other ingredients. This may be coloured to any hue by the addition of proper substances, and, when well worked and laid, makes a very beautiful floor. Besides these, halls, and some other ground-rooms, are paved or floored with marble or stone, and this either plain or dotted, or of a variety of colours but the universal practice of carpeting has, in a great measure, set aside the bestowing any ornamental work upon floors. See farther, the articles BEAM, BRIDGE, BUILDING, IRON-BRIDGE, &c.

ARCHITHEORES, in antiquity, deputies appointed by the different towns and states of Greece, who represented them, and were sent to offer sacrifices in their name, on the great altar of the Olympian Jupiter. Emissaries to inspire strangers with high ideas of the riches and power of their different cities and countries, they endeavoured to excel each other in splendour. Hence originated vases of gold and silver, gaudy robes, &c. in the offices of their religion.

ARCHITHOLUS (*αρχιθολος*, from *αρχι*, the first, and *θολος*, a chamber) The sudatorium, or principal room of the ancient baths.

ARCHITRAVE, in architecture, that part of a column which lies immediately upon the capital, being the lowest member of the entablature. Over a fire-place, this member is called the mantle-piece, and over doors or windows, the hyperthyron. The architrave is different in the different orders.

ARCHITRICLINUS, in antiquity, the director of a feast.

ARCHITYPE. See ARCHETYPE.

ARCHIVAULT, or ARCHIVALT, in architecture, the inner contour of an arch, or a band adorned with mouldings, running over the faces of the arch-stones, and bearing upon the imposts. It has only a single face in the Tuscan order, two faces crowned in the Doric and Ionic, and the same mouldings as the architrave in the Corinthian and Composite.

ARCHIVES (*archiva*, Lat.) The places wherein records or ancient manuscripts are

preserved The word is applied, figuratively, to the records and manuscripts themselves

**ARCHIVIST**, a keeper of the archives In Greece and Rome this was deemed an office of great dignity, and was given to none but men of the first rank

**ARCH LUTE**, a theorbo, or large lute, the bass-strings of which are doubled with an octave, and the higher strings with a unison This instrument was formerly in such répute in most parts of Europe, that solos were frequently performed upon it in public It is still used in Italy, where it is called *arcileuto*

**ARCHON**, a Greek word which literally signifies a commander This word is applied by some authors to divers offices, both civil and religious, in the eastern or the Grecian empire But it is more generally confined to the chief magistrate of the city and commonwealth of Athens After the Athenians had abolished monarchy, they created archons who were obliged to render an account of their administration to the people These were at first chosen for life, and made hereditary but a perpetual magistracy seemed to this free people too lively an image of royalty, they therefore reduced the term of an archon's administration to ten years, and ere long to one year There were nine archons, one of whom called *Polemarch* was minister of war, but nothing more they were all debarred from commanding the armies of the republic Thus their charge was only an honorary function, so little calculated to excite the envy of the people, that they never aspired eagerly after this dignity, from which they were excluded by the laws of Solon M de Pauw after contrasting this office with that of consul, observes that "the principal magistrate of a democratic government should never go to the wars, but, considered as the living image of the law, he ought to reside constantly in the centre of the state When this is not the case, says he we may predict infallibly such a confusion of political and military subordination that he himself shall be incapable of discriminating between his duties as magistrate and as captain"

**ARCHOPTOMA** (from *arxos* the anus and *optoma*, to fall down) A proclence or prolapse of the anus Exania Proproctia

**ARCHPHILOSOPHER** *s* (arch and philosopher) Chief philosopher (*Hooker*)

**ARCHPRELATE** *s* (arch and prelate) Chief prelate (*Hooker*)

**ARCHPRIEST** A priest established in some diocese, with a pre-eminence over the rest

**ARCHTREASURER** the great treasurer of the German empire This office was created with the eighth electorate, in favour of the elector palatine, who had lost his former electorate The dignity of archtreasurer was contested between the elector of Brunswick, who claimed it in virtue of his descent from the elector Frederic, and the elector palatine

**ARCHWISE** *ad* (arch and wise) In the sense of arch (*Ashe*)

**ARCTATION** *s* (from *arcto*, Lat.) Confinement to a narrow compass

**ARCTIC** *a* (from *arctos*) Northern; lying under the arctos, or bear

In astronomy, the arctic or north pole, is that which is raised above our horizon, and is nearly pointed out by the last star in the tail of Ursa minor The arctic circle is a less circle of the sphere parallel to the equator, and distant  $23^{\circ} 28'$  from the north pole This and the antarctic are often called polar circles, and may be conceived to be described by the motion of the poles of the ecliptic round those of the equator

**ARCTIUM** (*arctium*, *arctium*, from *arctos*, a bear, so called from its roughness) In botany, burdock a genus of the class and order syngenesia polygama equalis Reticulate chaffy, calyx globular, the scales ending in an incurved hook, seeds crowned with chaffy bristles Two species, both natives of Europe A lappa, the common burdock of our own wastes, and a bardana, found throughout Europe generally, and supposed by some botanists to be a mere variety of the former Both are occasionally employed in medicine as diuretics and pectorals For which, see *BARDANA*

**ARCTOMYS** Marmot In zoology, a genus of the class mammalia, order glires Fore teeth wedged, two in each jaw, grinders upper five in each jaw, lower four clavicles perfect This tribe of animals become torpid in the winter, ramble by day, feed on grass and roots, climb, burrow Head gibbous, rounded, ears short, or absent, body thick, tail short, hairy, fore feet four toed, with a very short thumb, hind-feet five toed, caecum large Eleven species, chiefly inhabitants of the Alps and North America The two following are mostly worthy of notice

1 A *Marmota* Alpine marmot Ears short, round, body brown, beneath reddish Inhabits dry, open places on the summits of the Alps and Pyrennees, drinks little, basks in the sun and is easily tamed lives wild among small tribes, with a centinel placed to give notice of danger, which is done by a hiss, forms a burrow with many chambers and entrances for the summer, and another lined with soft grass in which it remains torpid during the winter

2 A *bobac* Bobac Ears small, oval, tail hairy, fore-thumb clawed, body grey, beneath yellowish Inhabits dry and sunny mountains in Asia, and especially China Habits similar to a marmot See Nat Hist pl XXIII

**ARCTOPHYLAX**, in astronomy, the same as Bootes

**ARCTOPUS** In botany, a genus of the class and order polygama dioecia Male umbels compound, involucre five-leaved, petals five, stamens five, pistils two, abortive Androgenous umbel simple, involucre four parted, spinous, containing numerous male-flor in the disk, and four females in the ray Male, petals five, stamens five Female, petals five,

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styles two, seed one, two-celled, inferior. The only known species is a Cape-plant that resembles the *eryngium*.

**ARCIOTHECA** In botany, a genus of the class and order syngenesia polygamia necessaria. Receptacle ocellular, chaffy, downless, calyx imbricate. One species, a native of the Cape.

**ARCOTIS** In botany, a genus of the class and order syngenesia polygamia necessaria. Receptacle villous or chaffy, seeds with a five leaved crown, calyx imbricate, the scales scarious at top. Sixty-one species, all natives of the Cape. They may be subdivided into those A with villous receptacles B with chaffy receptacles C doubtful. The two species chiefly cultivated in our own green-houses on account of their beauty are the *angustifolia*, and a *aspera* the leaves of both which are highly elegant.

**ARCTURA** (from *arcto*, to straiten) An inflammation of the finger or toe from a curvature of the nail.

**ARCIURUS**, in astronomy, a fixed star, of the first magnitude, in the constellation of Bootes. The word is formed of *arcto*, bear and *ura*, tail, q d bears tail, as being very near it. This star was known to the ancients, as in the following verse of Virgil.

Arcturum, pluviasque Hyades, geminosque  
Iones

See also Job ix. q xxxviii. 32

**ARCIUS**, in astronomy, the Greek name for the two constellations by the Latins called *Ursi* major and minor, and by us the greater and less Bear.

**ARCALIAOSSA** (from *arcus*, a bow) The bones of the sticupul, from their shape.

**ARCUALIS** (from *arcus* a bow) The suture coronalis from its bow like shape.

**ARCUATE** Bowed Bent like a bow See **BOWED**

**ARCUATE** *a* (*arcutus*, Lat) Bent in form of an arch (*Bacon*)

**ARCULATION** *s* (from *arcuate*) 1 The act of bending any thing, incavation 2 The state of being bent, curvity, or crookedness 3 [In gardening] The method of raising by layers such trees as cannot be raised from seed, by bending down to the ground the branches which spring from the offsets.

**ARCUATUS** (from *arcus*, a bow) The jaundice from the suppoed resemblance of the colour of the eyes in this disease to the rainbow.

**ARCUBALISTER** *v* (from *arcus* and *balista*) A crossbow man (*Camden*)

**ARD** (Saxon) signifies natural disposition as, Goddard, is a divine temper (*Gilson*)

**ARDAMON**, in antiquity, a vessel of water placed at the door of a person deceased, to intimate that some one was dead and not buried.

**ARDEA** In zoology, a genus of the class and order aves grallae. Bill straight, pointed, long, subcompressed, with a furrow from the nostrils towards the tip, nostrils linear, tongue sharp, 3 feet four toed, cleft, toes connected at

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the base. Ninety-six species, thus subdivided

A Crested bill scarcely longer than the head

B Cranes head bald

C Storks orbits naked

D Herons middle claw serrate inwardly

E Herons bill gaping in the middle

Every quarter of the globe furnishes some species. We can only notice the following, for some of which, see Nat Hist pl I VII

1 A ciconia White stork. Inhabits Europe Asia, and America three feet three inches long, feeds on fishes and reptiles, and is in some countries held sacred for its use in destroying serpents, sleeps on one leg, in autumn migrates in large and orderly flocks to the fens of Egypt and Barbary, greater wing-coverts black.

2 A myr Common heron, of which there are two varieties. Inhabits almost every where in sunny places, is very voracious, and preys on fishes and reptiles. is a great depredator on fish-ponds, flies very high, with its head between its shoulders, and its legs pendulous, builds frequently in trees, and lays from four to five greenish blue eggs three feet three inches long.

3 A virescens Green heron. Of this there are four varieties, all beautiful. Inhabits South America, eighteen inches long, sits on trees. Bill greenish brown, a third part black, legs yellowish, crown deep green. Male quill feathers gold-green, secondary rusty-edged. Female crest hardly any, wing-coverts with triangular rufous white spots at the tip.

4 A stellaris Bittern. Head smoothish, body above rustaceous, with transverse spots, beneath pale, with long brown spots. There are two species. It inhabits the temperate parts of Europe, Asia, and both Americas, three feet two inches long, migrates northerly in summer, feeds on fishes and reptiles, about sun set rises in the air to a vast height in a spiral direction making a prodigious noise, builds among reeds, eggs from four to five, greenish ish.

**ARDEBIL**, or **ARDEBIL**, a town of Persia, in Asia. It was the capital of Persia before Alexander the Great's time, and has been honoured with the residence of several of their kings, particularly Scherh Eder the founder of the Schah sect. Lat 38 15 N, Lon 48 20 E.

**ARDEN**, the common name of forests among the Celts, from the widely extensive one which ranged for 500 miles in length across the country of Gaul or covered more than half the county of Warwick in Britain, and the sites of which still retain the appellation of Arden, to the much smaller one of the ancient Mancunon, that covered and surrounded the site of the present Manchester. Ard signifies either high or great, and ven or den either a hill or wood. Arduen, Ardven, or Arden, then, means a considerable wood.

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**ARDENCY.** *s* (from *ardent*.) Ardour; eagerness; warmth of affection (*Boyle*).

**ARDENNES,** a department of France, being part of the late province of Champagne.

**ARDENT** *a* (*ardens*, Lat. burning.) 1 Hot; burning, fiery (*Newton*) 2 Fierce, vehement (*Dryden*) 3 Passionate; Affectionate (*Prior*)

**ARDENT SPIRITS** are distilled from fermented vegetables, and are thus called on account of their taking fire and burning such as brandy, spirit of wine, rum, arrack, &c

**ARDENTLY** *ad* (from *ardent*.) Eagerly, affectionately (*Sprag*)

**ARDEERT**, a city of Ireland, capital of the county of Kerry, with a bishop's see It once had a university Lat. 52 16 N Lon 9 40 W

**ARDISIA** In botany, a genus of the class and order pentandria monogynia Calyx five-leaved, corol salver-shaped, with the border reflected, anthers large, erect, stigma simple; drupe superior, one-seeded Nine species, chiefly natives of the West India islands Of these the *humilis*, which, however, is a native of Ceylon, with thick, shining, alternate, evergreen leaves, and red flowers, is the most elegant

**ARDOUR** *s* (*ardor*, Lat. heat) 1 Heat 2 Heat of affection, as love, desire, courage (*South*) 3 The person ardent or bright (*Milton*)

**ARDRA**, or **ARDER**, a kingdom of Africa, on the Slave coast, the country is represented as extensive, populous, and fertile, but not much known It is situated on the east side of the Volta

**ARDRE**, a river of France, which joins the Loire at Nantes

**ARDRES**, a town of France, in the department of the Straits of Calais, and chief place of a canton, in the district of Calais It was taken by the Spaniards, in 1596, and restored two years after at the peace of Vervins Between Ardres and Guines, was the celebrated meeting of Henry VIII of England with Francis I king of France, in 1520 two posts SE Calais, and three NW of St Omer

**ARDUINA** Bastard lycium a genus of the class and order pentandria monogynia Corol one-petalled, stigma bifid, berry two-celled, seeds solitary The only known species is a native of the Cape, shrub-branched, with perennial leaves, flowers terminal and clustered; and bright red berries

**ARDUITY** *s* (from *arduous*) Height, difficulty

**ARDOUS**, *a*. (*arduus*, Lat) 1 Lofty, hard to climb (*Pope*) 2 Difficult (*South*)

**ARDUOUSNESS**, *s*. (from *arduous*) Height, difficulty

**ARE** The third person plural of the present tense of the verb *to be*

**AREA**, in architecture, the space or site of ground on which an edifice stands It is also used for inner courts

**AREA**, in geometry, denotes the superficial content of any figure Thus, if a figure, e g.

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a field, be in the form of a square, and its side be 40 feet long, its area is said to be 1600 square feet; or it contains 1600 little squares, each a foot every way The business of finding areas is generally called Mensuration of Superficies: it is well treated, both in theory and practice, in Dr Hutton's Mensuration

**AREA**, is also applied to any open surface, as the area before a house

**To AREAD** *v a*. (*arean*, Sax. to counsel.) To advise, to direct (*Milton*)

**ARECA** *Areca-nut* *fansel-nut* a genus of the class and order monœcia polyandria Spathe two-valved; corol three-petalled Male filaments nine, the three outer ones longer Fem drupe with an imbricate calyx Three species the *catechu*, and a *oryzæformis* of India, and the *oleracea* of the West Indies They are all lofty and elegant trees, shooting up as straight as an arrow, and beautifully arching their branches towards the soil The *catechu* was so denominated from a belief that the extract of its nut was the officinal catechu or terra Japonica, but this is a mistake (See *CATECHU*) The *oryzæformis*, or rice-shaped, bears a fruit used for chewing by the inhabitants of Cochinchina and Aniboyna, along with the betel-leaf The *oleracea* is almost the crown of the vegetable world It is the tallest and one of the most beautiful trees known to the naturalist, and every part of it is useful Its trunk is perfectly straight, about seven feet in circumference near the ground, tapering as it ascends, and often reaching the height of a hundred and seventy or two hundred feet Its numerous branches shoot forth at about five feet high from the ground in a circular direction, the lowermost spreading horizontally with the utmost regularity, while the extremes of many of the higher branches bend wavingly downwards, like so many plumes of feathers These when full grown are often more than twenty feet long The pithy interior part of the leaf is filamentous, and used like hemp or flax, for cordage of every kind The fruit is the widely celebrated cabbage, lying towards the top of the trunk, under the leaves in thin snow-white, brittle flakes, sweeter in taste than the almond, but strongly resembling it The sockets or grooves formed by the footstalks of the branches are used by the natives as cradles for their children On the inner side of the younger footstalks are tender pellicles which serve the purpose of the papyrus, and are converted into paper The trunk serves as gutterings the pith produces a kind of sago, and the nuts yield oil by decoction

**AREFACTION** *s*. (*arefactio*, Lat) The state of growing dry; the act of drying (*Bacon*)

**To AREFY** *v n* (*arefactio*, Lat) To dry; to exhaust of moisture (*Bacon*)

**AREMBERG**, a town of Westphalia, in Germany It is the capital of a county of the same name Lat 50 22 N Lon 7 3 E

**ARENA**, in architecture, the middle or body of a temple

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**ARENA**, the lowest part of an amphitheatre  
**ARENA'CEOUS** *a* (*arena*, Lat ) Sandy, having the qualities of sand (*Woodward*)

**ARENA'RIA** Sandwort sea-chickweed a genus of the class and order decandria trigynia Calyx five-leaved, spreading, petals five, entire, capsule superior, one-celled, many-seeded Thirty-six species, chiefly European, and many of them common to most countries of Europe (see Botany, pl V ) Those most frequently met with in our own country are a peplodes on the sea-coast, a trinerchia in the woods, a serpyllifolia on old walls, a rubra in sandy fields, a maritima on the sea-coast, a verna on the mountains, a tenuifolia in sandy plains

**ARENARIi**, in antiquity, slaves of the lowest rank who, as gladiators, fought with beasts in the arena

**ARENOSE** *a* (from *arena*, Lat ) Sandy, full of sand

**ARENSBERG**, a town of Westphalia, in Germany Lat 51 25 N Lon 8 20 E

**ARENSBERG**, an episcopal and sea-port town of Livonia, in Sweden Lat 58 15 N Lon 25 40 E

**ARENULOUS** *a* (from *arenula*, Lat ) Full of small sand, gravelly

**AREOLA** (*areola*, dim of *area*, a void space ) A small brown circle, which surrounds the nipples of females

**AREOMETER** See **ARÆOMETER**

**AREOMETRY** See **ARÆOMETRY**

**AREOPAGUS**, or **ARÆOPAGUS**, a sovereign tribunal at Athens, famous for the justice and impartiality of its decrees, to which the gods themselves are said to have submitted their differences. It was in the town, on a rock or hill opposite to the citadel The word signifies strictly, rock of Mars, from *μαρς*, hill, and *αγος*, belonging to Mars Mr Spon, when at Athens, found some remains of the areopagus still existing in the middle of the temple of Theseus, which was heretofore in the middle of the city, but is now without the walls The foundation of the areopagus is a semicircle, with an esplanade of 140 paces round it, which properly made the hall of the areopagus There is a tribunal cut in the middle of a rock, with seats on each side of it, where the areopagites sat, exposed to the open air

The areopagus when originally constituted was nothing more than a simple criminal tribunal, intended particularly to judge murderers and incendiaries, without possessing the smallest influence on the civil government of the republic But Solon, guided by motives which cannot now be explained, invested the areopagus with the vague powers of a directing senate, for the general inspection of the state, and preservation of the laws In consequence of this, the areopagites had a continual tendency to acquire authority in every department of the state, yet they could never obtain the direction of religious matters, or any influence in theological concerns It has been commonly asserted that judgments were always given in

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the areopagus by night but this is certainly erroneous, for at Athens, as well as Rome, no sentence could be passed while the sun was under the horizon It is also false, that orators in the presence of the areopagites were restrained from employing exordiums, perorations, and all the great springs of an eloquence generally exerted to produce either terror or pity Antiphon, pleading before their tribunal concerning the murder of Herod, introduced, not only an exordium, but the longest peroration ever known Indeed, two distinct crimes could not be confounded before this tribunal and when any man had been arraigned for homicide, it was illegal to accuse him, at the same time, of theft or sacrilege This was not only proper, but necessary, for the areopagus had not the power of judging the two last of these crimes, which appertained exclusively to another court The suffrages of these judges were long kept secret, from motives of personal security as well as propriety The areopagites were obliged, in all cases, to hear a tetralogy, or four pleadings, two of which were for the prosecution, and as many in favour of the accused It is only necessary to read the tetralogies of Antiphon, to be convinced that they contained all the subtleties of which the human mind is susceptible The number of persons who composed the areopagus varied from circumstances At first the number was nine An annual addition of nine new members always took place, because those who had been archons were entitled to a place there, after their year of magistracy had expired the assembly consisted in general of between three and four hundred persons They were judges for life According to the institutes of Solon, this court should have been composed alone of nobles, or such as were of the equestrian order, but when a real democracy was established, the plebeians likewise enjoyed the same privilege whenever they had been archons De Pauw on the Greeks, § 6

As this assembly exhibited the greatest firmness in punishing crimes, and the nicest circumspection in reforming manners, as it never employed chastisement till advice and menaces were exhausted, it acquired the esteem and confidence of the people, even whilst it exercised the most absolute power Its meetings were held three times in every month, viz on the 27th, 28th, and 29th days, but on any urgent business, the senators assembled in the royal portico The court was divided into several committees, each of which took cognizance of separate causes, if the multiplicity of business would not allow time for them to be brought before the whole senate and this was done by lots, that the causes might not be prejudged In crimes that concerned religion or the state, the power of this court was limited to preparing the matter for a trial, and it then made its report to the people, without coming to any conclusion The accused then had it in his power to offer new pleas in his defence, and the people named orators to conduct the prosecution

cution before one of the superior courts. Trials in the areopagus were preceded by tremendous ceremonies. The two parties, placed amidst the bleeding members of the victims, took an oath, which they confirmed by dreadful imprecations against themselves and families. They called to witness the Eumenides who, from a neighbouring temple, dedicated to their worship, seemed to listen to the invocation, and prepare to punish the perjured. They then proceeded to the trial, though not, as has been commonly affirmed, without allowing exordium, epilogue, or appeal to the passions. After the question had been sufficiently discussed, the judges silently deposited their suffrages in two urns, one of brass, called the urn of death, and the other of wood, called the urn of mercy. This mode of giving votes was afterwards abandoned, and they were delivered in public, by casting their ballots or flints upon two tables, one for those that were acquitted, and the other for those condemned: when the numbers were equal, an inferior officer added, in favour of the accused, the suffrage of Minerva, so called, because, according to an ancient tradition, this goddess being present in the court of areopagus at the trial of Orestes, gave her casting vote to turn the scale of justice. (*British Encyclop.*)

**AREOTICK** *a. (aquosus)* In medicine, efficacious in opening the pores, attenuant.

**ARFOQUIPA**, a city of Peru, in South America. There is a volcano in its neighbourhood. Lat 16 40 S Lon 75 30 W.

**ARETHUSA**. The most celebrated of this name was a nymph of Elis, daughter of Oceanus, and one of Diana's attendants. As she returned one day from hunting, she sat near the Alpheus, and bathed in the stream. The god of the river was enamoured of her, and he pursued her over the mountains and all the country, when Arcthusa, ready to sink under fatigue, implored Diana, who changed her into a fountain. The Alpheus immediately mingled his streams with hers, and Diana opened a secret passage under the earth and under the sea, where the waters of Arethusa disappeared, and rose in the island of Ortygia near Syracuse, in Sicily. The river Alpheus followed her also under the sea, and rose also in Ortygia, so that, as mythologists relate, whatever is thrown into the Alpheus, in Elis, rises again, after some time, in the fountain Arethusa, near Syracuse.

**ARETHUSA**. In botany, a genus of the class and order gynandria diandria. Nectary close-leaved, tubular, within the bottom of the corol; the lower lip united to the styles. Seven species, all natives of North America or the Cape.

**ARETIA**. In botany, a genus of the class and order gynandria monogynia. Corol salver-shaped, five cleft, with an ovate tube, stigma a depressed head, capsule one-celled, globose, nearly five-angled. Four species, all of Switzerland or the Alps, some with blue, others with yellow flowers.

**ARETIN, or ARETINO** (Guido), an Italian musician, was a benedictine monk in the 11th century. He published a treatise on music, entitled *Micrologus*, and a letter printed by Baronius in his *Annals*, under the year 1022.

He introduced a reformation of the Greek system. He, indeed, appears to have been the first who discovered its incompatibility with harmony, or who had any true idea of the combination of sounds. He added a note below the *prolambanomenos*, or lowest note, which he called *Gamma*, and so arranged the scale as to serve better the great purposes of harmony as well as of melody, by dividing it into hexachords, to the notes of which he applied the six monosyllables, *ut, re, mi, fa, sol, la*, taken from a Latin hymn, written in honour of John the Baptist. Guido also improved the ancient manner of writing music. The method had been to place all the notes upon one line and to distinguish them from each other by the letters of the alphabet, but he substituted certain points, which he disposed upon and between four lines, and afterwards five, and from these points we derive the term counterpoint. The harmony introduced by Guido was as simple as possible, consisting only of the fundamental note its third, fifth, and octave. These and other improvements of this original theorist, extending themselves by degrees from Italy into the other Christian countries of Europe, were received by the whole church, while ingenious imitators arising from day to day, and still improving upon their inventive master, enlarged the bounds both of melody and harmony, and freed them from the narrow limits of the ancient Greeks and Romans. (*Buxby*.)

The history of Guido's invention of solmisation being somewhat curious, it is here added.

In his retirement he seems to have devoted himself to the study of music, particularly the system of the ancients, and, above all, to reform their method of notation. The difficulties that attended the instruction of youth in the church offices were so great, that, as he himself says, ten years were generally consumed barely in acquiring the knowledge of the plain song, and this consideration induced him to labour after some amendment, some method that might facilitate instruction, and enable those employed in the choral office to perform the duties of it in a correct and decent manner. If we may credit those legendary accounts that are extant in old monkish manuscripts we should believe he was assisted in his pious intention by immediate communications from heaven, some speak of the invention of the syllables as the effect of inspiration, and Guido himself seems to have been of the same opinion; by his saying it was revealed to him by the Lord; or, as some interpret his words, in a dream: but grave historians say, that being at veepers in the chapel of his monastery, it happened that one of the officers appointed for that day was the hymn to St. John.



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**UT** queant laxis  
**MIRA** gestorum  
**SOLVE** polluitis

**RESONARE** fibris  
**FAMULI** tuorum  
**LABIS** reatum,  
Sancte Joannes

During the performance of the hymn, he remarked the iteration of the words, and the frequent returns of *ut, re, mi, fa, sol, la* he observed likewise a dissimilarity between the closeness of the syllable *mi*, and the broad open sound of *fa*, which he thought could not fail to impress upon the mind a lasting idea of their congruity, and immediately conceived a thought of applying the six syllables to perfect an improvement either then actually made by him, or under consideration, viz that of converting the ancient tetrachords into hexachords

Struck with the discovery he retired to his study and having perfected his system, began to introduce it into practice the persons to whom he communicated it were the brethren of his own monastery, from whom it met with but a cold reception, which in the epistle to his friend, he ascribes undoubtedly to its true cause, envy however, his interest with the abbot, and his employment in the chapel, gave him an opportunity of trying the efficacy of his method on the boys who were training up for the choral service, and it exceeded the most sanguine expectation "To the admiration of all (says cardinal Broussus), a boy thereby learnt, in a few months, what no man, though of great ingenuity, could before that attain in several years

The fame of Guido's invention soon spread abroad, and his method of instruction was adopted by the clergy of other countries we are told by Kircher, that Hermanus bishop of Hamburg, and Elvincus bishop of Osnaburg made use of it, and by the authors of the *Histoire Littéraire de la France*, that it was received in that country, and taught in all the monasteries in the kingdom It is certain that the reputation of his great skill in music had excited in the pope a desire to see and converse with him, of which, and of his going to Rome for that purpose, and the reception he met with from the pontiff, he himself has given a circumstantial account

**AREIOLOGY**, that part of moral philosophy which treats of virtue, and the means of arriving at it

**ARFZZO**, an ancient town of Florence, in Italy, seated on a mountain Lat 43 27 N Lon 12 0 E

**ARGAL**, or **ARGOL**, the tartar adhering to the sides of the teeth

**ARGALI** See **Ovis**

**ARGEA**, in Roman antiquity, thirty human figures, made of rushes, thrown annually by the priests or by the vestals into the Tiber, on the day of the Ides of May Different reasons are assigned for this ceremony

**ARGEMONE**. Prickly poppy a genus of the class and order polyandria monogynia Calyx three leaved, petals six, capsule half-valved Three species, Mexico, Armenia, Pyrenees

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**ARGENT**, the common French word for silver, of which metal all white fields or charges are supposed to consist Argent of itself is used in heraldry to signify purity, innocence, beauty, and gentleness

**ARGENTAL MERCURY**, a native amalgam of silver, by which name it was formerly known It received its present appellation from C Haüy, whose experiments have made us acquainted with many of its properties from its great rarity, however, it is as yet but imperfectly known, scarcely any person besides having examined it with much attention This mineral is found in the mines of Hungary, and, when separated from its ore, has the colour and resplendence of silver or polished tin, or rather more frequently of liquid mercury, because it generally retains at its surface a thin stratum of that metal Its crystals are dodecaedral-rhomboidal, in various modifications Its specific gravity is 14 1192, being considerably greater than that of either of the two metals of which it is composed This substance has been carefully analysed by C Cordier, engineer of mines in France, and found to contain 72 5 parts of mercury to 27 5 of silver it appears also to be a real chemical combination of the two metals, and not a paste-like mixture, from which circumstance the propriety of its present name instead of the former one of an amalgam, is obvious See the *Philosophical Magazine*, vol xiv p 41, or *Journal des Mines* No 67

**ARGENTINE FLOWERS OF ANTIMONY** See **ANTIMONY**

**ARGENTARIUS**, in antiquity, a money-changer or banker

**ARGENTIUIL**, a town of the isle of France Lat 48 52 N Lon 2 22 E

**ARGENTFUIL**, a town of France, in the department of the Yonne, three leagues from Tonnerre

**ARGENTICOMUS**, among astrologers, a silver haired comet, from the appearance of which great changes in our system are predicted

**ARGENTINA** Argentine In zoology, a genus of the class and order pisces abdominalia Teeth in the jaws and tongue gill membrane with eight rays, vent near the tail, ventral fins of many rays Four species, two inhabitants of the Red sea, one Mediterranean, one fresh waters of Carolina A sphyæna is the European argentum Anal fin with nine rays inhabits the Mediterranean, and sometimes wanders to the British coasts from two to four inches long body round, tapering, back and sides, as far as the lateral line, pale ash mixed with green, below the line and belly fine silvery air-bladder come both sides, appearing as if covered with silver leaf, and is used in the manufacture of artificial pearls

**ARGENTINE** See **ARGENTINA**

**ARGENTIERRA**, an island near that of Milo, in the Archipelago It receives its name from the silver mines found in it Lat 36 50 N Lon 23 10 E



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**ARGENTON**, a town of France, in the Department of Indre Lat 46 35 N Lon 1 38 E

**ARGENTUM** Silver Of a whitish colour not tarnished by the air, hard and tenacious, sonorous, exceedingly malleable, and ductile, specific gravity before hammering 10.478 melting when perfectly red hot, and its brilliancy much increased Soluble in nitric acid, giving no colour to the solution, and capable of being precipitated from it by copper, iron, or zinc. Thirteen species We shall enumerate a few

1 **A nativum** Native, or capillary silver Found in various parts of Great Britain, particularly in the copper mines of Cornwall, in the mines of Mexico and Peru, and in most of the mines on the continent Rarely to be met with quite pure, but most commonly combined with a greater or less proportion of copper, and has sometimes its surface striate assumes various forms, and is occasionally found in prisms or cubes In malleability it yields only to gold, as it may be beaten out into leaves the 160,000th part of an inch thick, and may be drawn out to so fine a wire that a single grain can be extended nearly 400 feet in length Its tenacity is likewise such that a wire 0.078 of an inch in diameter will support 17,813 pounds without breaking When melted, if the heat be increased, the liquid metal boils, and will at last be volatilized When dissolved in nitric acid and precipitated in lime water, it falls to the bottom in the form of a dark greenish-brown powder When dissolved in nitric acid and precipitated with mercury, it shoots up in a shrub-like form, and is then called *arbor dianae* Its solution is colourless, highly caustic, giving the hair, skin, and almost all animal substances, an indelible black colour, and when evaporated till a pellicle begins to form on its surface, it deposits on cooling transparent crystals of nitrat of silver (see **ARGENTUM NITRATUM**) If its precipitate by lime water be dried and washed with a solution of pure ammonia, it has a most dangerous fulminating property, exploding most violently on the slightest touch or friction This powder is denominated *fulminating powder*, or *pulvis fulminans*

2 **A nigrum** Black silver Black silver ore Found in the silver mines of Sieny, Brittany, Saxony, Hungary, and Bohemia, sometimes covering other minerals as with a coating, sometimes interspersed in larger or less particles, or in a pulverised state commonly combined with sulphur, arsenic, copper, or a little iron

3 **A corneum** Corneous silver corneous silver-ore Murfat of silver the last name from its containing a considerable portion of muriatic acid Found in the mines of Mexico, Peru, Siberia, Hungary, Bohemia, Saxony, and Germany It melts before a candle like wax or asphalt; and before the blow-pipe leaves small grains of pure silver Soft and easily cut with a knife. Colour white, grey, yellowish, greenish-yellow, or brown

4 **A electrum** Auriferous silver. Found

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in the mountain Schlangenburg in Siberia, and in the mines Kongeburg in Norway, of a pale brass colour sometimes containing 28 of gold and 72 silver in the 100

5 **A stibiatum** Antimonial silver ore, or antimonial native silver Found near Wittichen in the district of Turstenburg

6 **A vitreum** Vitreous silver, sulphuret of silver sulphurated silver ore Found in the mines of Siberia, Norway, Saxony, Bohemia, Hungary, Spain, and America, generally superficial, and running like veins through other fossils It is one of the richest ores of silver, usually containing 85 per cent. of pure silver

7 **A rubrum** Ruby silver ore There are two varieties, light red silver ore and dark red silver ore Found in various mines of Peru, Chili, France, Spain, Germany, Saxony, Hungary, &c with arsenic, silica, or other ores of silver. Contains silver 56, antimony 10, sulphur 15, oxygen 12, and a little arsenic

**ARGENTUM ALBUM**, in our old customs, silver coin, or pieces of bullion that passed for money

**ARGENTUM DEI**, anciently signified earnest money, or that given to bind a bargain

**ARGENTUM FULMINANS**, or **FULMINATING SILVER**, which see, as also **ARGENTUM**

**ARGENTUM MOSAICUM**, or **MUSIVUM**, a metallic alloy in the form of silvery flakes, used for the colouring of plaster figures, and for other purposes, is a pigment It is formed of equal parts of tin, bismuth, and mercury, and may therefore be called a compound amalgam When used, it is mixed with white of eggs, or spirit varnish, and then applied to the proposed work, which is afterwards to be burnished

**ARGENTUM NITRATUM** Causticum lunare Lunar caustic This preparation of silver is called *nitras argenti* fuses in the new chemical nomenclature Its virtues are corrosive and adstringent Internally it is exhibited in very small quantities in epilepsy, and externally it is employed to destroy fungous excrescences, callous ulcers, fistulas, &c In the latter disease it is injected in the quantity of from two grains to three dissolved in ounce of water

**ARGENTUM VIVUM** See **HYDRARGYRUS**

**ARGESTES**, is used by Vitruvius for the wind which blows from that quarter of the horizon, which is 75 deg from the south, and westward Ricciolus uses the term to denote the wind which blows at 22 deg 30 min from the west towards the north, coinciding with that which is otherwise called West-North-West

**ARGETENAR**, a small fixed star in Eridanus

**ARGIL** See **CLAY** and **ARGILLA** Native argil, or *terre luna*, is a mineral of a snow-white or yellowish white colour It is found in kidney-form masses of various sizes It is opaque when dry, but when soaked in water, semitransparent It is often found mixed

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with a small proportion of carbonate of lime, and sometimes a slight quantity of iron and silic. Mineral acids dissolve it. This mineral is chiefly, if not exclusively, brought from Halle, in Saxony. Its specific gravity, according to Bergman, is 1.305, to Gmelin 1.609.

**ARGILLA** Argil. A genus of the class earths, order argillaceous, consisting of alumina and silica with generally some oxyd of iron and inflammable matter, opaque, without lustre, of a common form, soft to the touch, earthy, lightish, imbibing and retaining water, and oil, by each of which it is softened, and rendered plastic by the former, and emitting an earthy smell not effervescing with nitric acid, contracting and becoming harder in the fire. Thirty species the following the chief.

1 *A. porcellana* Porcelain earth or clay. It is found loose, in a compact form, in a powdery form, and mixed with micaceous particles. Cornwall, Japan, China, Saxony, and various parts of Europe, and is supposed to originate from decomposed feldspar. It is principally used in the manufacture of China ware. Contains alumina 60, silica 20, air and water 12.

2 *A. leucargilla* Pipe-clay, potters-clay, common clay. Found very generally in Europe, especially in Normandy, near Cologne, and in Livonia. Colour varying from pure white to black, often variegated. When first exposed to heat it becomes blackish from the inflammable matter it often contains, but by continued heat it turns pure white. It is used for tobacco pipes and various vessels.

3 *A. lithomarga* Lithomarge, potter's clay of Thomson. Several varieties. Found in various parts of the world in clay and limestone rocks, in long layers between clay and limestone, sometimes compact, sometimes in the form of powder of various colours, alters its colour by fire, becomes very hard, and by continued heat melts into a red porous clay. It is entirely diffusible by water, and when duly moistened very ductile, on which account it is highly useful in potteries and China-manufactories.

4 *A. fullonica* Fullers earth. Found in Britain, Sweden, Saxony, and Portugal. Brown or grey, with generally a shade of green, rarely flesh colour. Receives a polish from friction, does not adhere to the tongue, feels greasy. From the great avidity with which it absorbs oil, it is used by fullers to take grease out of cloth.

5 *A. lemnia* Lemnian earth. Found chiefly in the isle of Lemnos and in Silesia. Formerly used as a bole in medicine.

6 *A. communis*. Common clay. Several varieties. Found in almost every part of the globe, frequently forming vast strata below the surface, and often bearing the impressions of vegetables. Colour bluish and yellowish grey, smoke-colour, dull bluish, rarely green or flesh-colour, and impregnated with a greater or less degree of silica.

7 *A. cimolia* Cimolite. Found in the isle of Argenteira in the Archipelago, where it

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is used for whitening stuffs. Pearl-grey colour, becoming white before the blow-pipe.

8 *A. rubrica*. Reddle. Found in Siberia, Dalecarlia, Bohemia, Portugal, and France, generally among iron ore, with which it commonly abounds. Colour dark cochineal red, or intermediate between brick and blood red.

9 *A. lutea* Yellow ochre. Found near Weitra. Feels smooth or somewhat greasy. Contains alumina 50, oxyd of iron 40, water acidulated by sulphuric acid 10.

10 *A. arvensis* Field-clay. Loam. Cereous, forming small clods when moistened, splitting into large clefts while drying, and becoming at last powdery, vitrifying in the fire. Found every where in cultivated lands.

**ARGILLACEOUS** *a* (from *argil*) Clayey, consisting of argil, or potters' clay.

**ARGILLACEOUS EARTHS**. An order containing principally aluminous earths. See **ALUMINE** and **ORGYCTOLOGY**.

**ARGILLOUS** *a* (from *argil*) Consisting of clay, clayish, containing clay (*Brown*).

**ARGNES** (Gerard d'), a French mathematician, was born at Lyons, in 1597, and died there in 1661. He was the friend of Descartes, whom he defended with great spirit. He wrote a treatise on Perspective, of Conic Sections, the Practice of Drawing, and a treatise on Stonecutting.

**ARGO**, in antiquity, a ship or vessel celebrated among the poets, being that wherein the argonauts, of whom Jason was the chief, made their expedition in quest of the golden fleece. Sir Isaac Newton thinks that this expedition was really an embassy sent by the Greeks, during the intestine divisions of Egypt, in the reign of Amenophis, to persuade the nations upon the coasts of the Euxine and Mediterranean seas to take that opportunity of shaking off the yoke of Egypt, which Sesostris had laid upon them; and that fetching the golden fleece was only a pretence to cover their true design.

**ARGOL**, or **ARGAL**, in chemistry, the same as tartar.

**ARGOLIS**, so called from an ancient prince whose name was Argos, one of the six districts of Peloponnesus, situated on the north-east side, was bounded by Achaia on the north, Arcadia on the west, Laconia and the Argolic gulf on the south, and the Aegean sea on the east. This province is peculiarly interesting to the Grecian antiquarian and historian, because it was the cradle of the Greeks, since it first received the foreign colonies by whom they were civilized.

**ARGONAUTA**. In zoology, a genus of the class and order vermes testacea. Animal a septa or chlo shell univalve, spiral, involute, membranaceous, one called. Five species. The following is well entitled to notice.

*A. argo*, Nautilus. Keel or ridge of the shell slightly toothed on each side. Inhabits the Mediterranean and Indian ocean, and was supposed in former ages to have taught mankind the first use of sails. When it means to sail, it discharges a quantity of water, by

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which it was made heavier than the sea-water, and rising to the surface erects its arms, and throws out a membrane between them; by which contrivance it is driven forwards like a vessel under sail, hanging two of its arms over the shell, to serve as oars or as a rudder. The nautilus in the Linnæan system is an animal somewhat different from the argonauta, for which, see NAUTILUS.

**ARGONAUTIC**, something relating to the argonauts. The argonautic expedition is one of the greatest epochs which sir Isaac Newton endeavours to settle, and from thence to rectify the ancient chronology. Thus he shews, by several authorities, to have been one generation, or about thirty years earlier than the taking of Troy, and forty-three years later than the death of Solomon.

**ARGONAUTS**, in antiquity, a company of fifty-one, according to Valerius Flaccus, or according to Apollonius Rhodius, forty-four heroes, who embarked along with Jason in the ship *Argo* for Colchus, with a design to obtain the golden fleece.

**ARGO NAVIS**, in astronomy, the Ship *Argo*, a southern constellation, containing 48 stars in the following order, 1 6 11 13 14 3.

**ARGOPHYLLUM**. In botany, a genus of the class and order pentandria monogynia. Calyx five cleft, superior, corol five petalled, nectary pyramidal, five-angled, as long as the corol, capsule three-celled, many-seeded. The only known species is a native of New Caledonia.

**ARGOS**, a scaport of Turkey in Europe, in the Morea 2, miles S of Corinth. Lat 37 30 N. Lon 2, 5 E.

**ARGOSY**, *s* (from *Argo*, the name of Jason's ship). A large vessel for merchandise, a carrack (*Shakspeare*).

To **ARGUE**, *v* *n* (*arguo*, Latin). 1 To reason, 2 to offer reasons (*Locke*). 2 To persuade by argument (*Congreve*). 3 To dispute (*Locke*).

To **ARGUE**, *v* *a*. 1 To prove any thing by argument (*Donne*). 2 To debate any question. 3 To prove, as an argument (*Milton*). 4 To charge with, as a crime (*Dry*).

**ARGUER**, *s* (from *argue*). A reasoner, a disputer; a controvertist (*Atterbury*).

**ARGUIN**, an island of Africa, on the western coast of Negroland. The Dutch took this place from the Portuguese in 1638, and the French took it from the Dutch. Lat 20 30 N. Lon 17 20 W.

**ARGUMENT**, *s* (*argumentum*, Lat). 1 A reason alleged for or against any thing (*Locke*). 2 The subject of any discourse, or writing (*Milton Sprat*). 3 The contents of any work summed up by way of abstract (*Dryden*). 4 Controversy (*Locke*).

**ARGUMENT**, in astronomy, is used to denote any known arch or quantity, by which another required arch or quantity may be found. For example, the argument of that part of the equation of time which arises from the unequal angular motion of the earth in its orbit, is the sun's anomaly, because that part of

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the equation depends entirely upon the anomaly. Again, the argument of the moon's or a planet's latitude is its distance from its node, because upon this the latitude depends.

**ARGUMENT**, in rhetoric, is some reason, or series of reasoning, by which we establish the proof, or shew the probability, of some given proposition.

Logicians, somewhat more scientifically, define argument, a medium, from whose connection with two extremes, the connection of the two extremes themselves is inferred.

Arguments are termed grammatical, logical, physical, metaphysical, moral, mechanical, theological, &c according to the art, science, or subject, from whence the middle term is borrowed. Thus, if we prove that no man should steal from his neighbour, because the scripture forbids it, this is a theological argument. If we prove it from the law of the land, it is political; but if we prove it from the principles of reason and equity, the argument is moral. Arguments are either certain and evident, or doubtful and merely probable. Probable arguments are those whose conclusions are proved from some probable medium. Evident and certain arguments, are those which prove their conclusions by clear media and undoubted principles: these are called demonstrations. In reasoning, Mr Locke observes, that men ordinarily use four sorts of arguments. The first is to allege the opinions of men, whose parts and learning eminency power, or some other cause, have gained a name, and settled their reputation in the common esteem, with some kind of authority: this may be called *argumentum ad circumstantiam*. Secondly, another way is to require the adversaries to admit what is alleged, as a proof, or to assign a better: this he calls *argumentum ad ignorantiam*. A third way, is to press a man with consequences drawn from his own principles or concessions: this is known by the name of *argumentum ad hominem*. Fourthly, the using proofs drawn from any of the foundations of knowledge or probability: this he calls *argumentum ad judicium*, and observes, that it is the only one of all four, that brings true instruction with it, and advances us in our way to knowledge.

**ARGUMENTAL**, *a* (from *argument*). Belonging to argument, reasoning (*Pope*).

**ARGUMENTATION**, *s* (from *argument*). Reasoning, the act of reasoning (*Watts*).

**ARGUMENTATIVE**, *a* (from *argument*). Consisting of argument, containing argument (*Atterbury*).

**ARGUMENTUM AD HOMINEM**. See ARGUMENT.

**ARGUS**, in fabulous history, the son of Aristor, was said to have had a hundred eyes, fifty of which were always open. Juno made choice of him to guard Io, whom she had transformed into a white heifer, but Jupiter pitying Io, for being so closely confined, sent Mercury, who, with his flute, charmed Argus to sleep, scaled up his eyes with his cadu-

æus, and cut off his head Juno, to reward his fidelity, turned him into a peacock, and placed his eyes in the tail.

ARGUS is also the name of a very curious shell, about three inches long, two in diameter, and somewhat less in height. It is covered with a multitude of round spots, like eyes, from whence it has its name. It is brought from Africa and the East Indies.

ARGUIE *a* (*arguto*, Ital *argutus*, Lat.)

1 Subtle, witty, sharp 2 Shrill

ARGUTÆ, witty and acute sayings, which commonly signify something further than what their mere words at first sight seem to import—Writers on rhetoric speak of divers species of argutæ, which are of too little consequence to require a particular enumeration.

ARGYLLSHIRE, a county of Scotland, bounded on the N. by Inverclyde shire, on the E. by the counties of Perth and Dumbarton, on the S. and W. by the Atlantic ocean, by which it is broken into islands and peninsulas. It is not quite 100 miles long from the Mull of Cantyre to its N. E. extremity its breadth is unequal, about 30 miles where greatest. It contains more than 71,000 inhabitants.

ARGYRASPIDES or ARGYROSPIDES, in antiquity, persons armed with silver bucklers, or bucklers silvered. The argyraspides, according to Quintus Curtius, made the second corps of Alexander's army: the first was the phalanx.

ARGYRITE AGONLS, in antiquity, games in which money was the prize.

ARGYTHAMNIA In botany, a genus of the class and order monœcia tetrandria. Males calyx four-leaved, petals four. Female calyx five leaved, corollless, styles three, forked, capsule three celled, seæ solitary. The only known species is a native shrub of Jamaica.

ARIA DI BRAVURA, in music or as it is familiarly called, a Bravura, is a melody at once florid, rapid, and energetic. Its divisions are volute, and the passages every-where bold and heroic. The execution of this species of air is generally confined to soprano voices, and it is only to powers of the first order that we can look for its just performance.

ARIA FUGATA (Ital.) Fugued air. An elaborate species of melody much used in the last age and frequently found in the operas of Handel, Bononcini, and their contemporaries. The aria fugata was so called, because the accompanying parts were written in fugue. This laboured kind of song writing is now judiciously declined.

ARIADNÆA, in antiquity, two festivals held at Naxos in honour of two women named Ariadne. One of these festivals was mournful, the other sprightly and cheerful, corresponding with the different characters of the two women.

ARIADNE, daughter of Minos 2d king of Crete, by Pasiphaë, fell in love with Theseus, who was shut up in the labyrinth to be devoured by the Minotaur. She gave him a clue of thread, by which he extricated himself

from the different windings of his confinement. After he had conquered the Minotaur, he carried her away and married her; but he afterwards forsook her, though already pregnant. Ariadne was so disconsolate upon being abandoned by Theseus, that she hung herself. According to some writers, Bacchus loved her after Theseus had forsaken her, and he gave her a crown of seven stars, which, after her death, were made a constellation.

ARIANS, followers of Arius, a presbyter of the church of Alexandria about the year 315, who maintained that the Son of God was totally and essentially distinct from the Father, that he was the first and noblest of those beings whom God had created, the instrument by whose subordinate operation he formed the universe, and therefore inferior to the Father both in nature and dignity; also, that the Holy Ghost was not God, but created by the power of the Son.

The Arians owned that the Son was the word, but denied that word to have been eternal. They held that Christ had nothing of man in him but the flesh to which the *æto* or word was joined, which was the same as the soul in us. (See Lardner's Credibility, &c. vol. ix. b. i. c. 67.) The Arians were first condemned and anathematized by a council at Alexandria in 320, and afterwards by 380 fathers in the general council of Nice, assembled by Constantine in the year 325. They also underwent various revolutions, persecuting and being oppressed by turns, under succeeding emperors, according to the degree of interest they had in the civil power, till at length Theodosius the Great exerted every possible effort to suppress and disperse them.—The Arians were divided into various sects, of which ancient writers give an account under the names of Semi Arians, Eusebians, Aetians, Eunomians, Acacians, Psathyrians, and others. But they have been commonly distributed into three classes, viz. the Genuine Arians, Semi Arians and Eunomians. The appellation Arian has been indiscriminately applied, in more modern times, to all those who consider Jesus Christ as inferior and subordinate to the Father, and whose sentiments cannot be supposed to coincide exactly with those of the ancient Arians.

ARICA, a sea port town of Peru, in South America. It was destroyed by an earthquake in 1605. Great quantities of Guinea pepper are sent from this place to Lima. It was the port to the mines of Potosi, but the silver has been carried over land to Lima for many years. Lat 18 27 S. Lon 71 6 W.

ARICA supposed by Camden to be the island of Alderney, on the coast of France.

ARID *a* (*aridus*, Lat.) Dry, parched up (*Arbutnot*)

ARIDEL, or ADIGEGR, a fixed star of the 2nd magnitude, marked  $\alpha$  in Cygnus.

ARIDITY *s* (from *arid*) 1 Dryness, sterility (*Arbutnot*) 2 A kind of insensibility in devotion, contrary to unction or tenderness (*Meriss*)

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**ARIES**, the battering ram See **BATTERING RAM**.

**ARIES**, the Ram, in astronomy, a zodiacal constellation, consisting of 46 stars in this order, as to magnitudes, 0 1 1 3 5.36 It is also the first of the signs of the ecliptic into which the sun enters about the 21st of March, which is the beginning of the spring quarter

**ARIES**, in zoology See **RAM**

**To ARIETATE** *v n* (*arieto*, Latin) 1

To butt like a ram 2 To strike in imitation of the blows which rams give with their heads

**ARIETATION** *s* (from *arietate*) 1

The act of butting like a ram 2 The act of battering with an engine called a ram (*Bacon*)

3. The act of striking or conflicting in general (*Glanville*).

**ARIETTA** (*Ital*) A short air, or melody The diminutive of *aria*

**ARIGHT** *ad* (from *a* and *right*) 1

Rightly, without mental error (*Dryden*)

2 Rightly, without crime (*Psalms*) 3

Rightly, without failing of the end designed (*Dryden*)

**ARIL** (*arillus*) The outer coat of a seed falling off spontaneously or, inclosing the seed partially (*interdum includit partialiter semen Reg Veg*) As in coffeea, jasminum, cynoglossum, cucumis, dictamnus, dioema, celastrus, euonymus. Scopoli has distinguished such fruits by the name of *theca*

**ARIMANIUS**, one of the chief deities of Persia This deity, according to the philosophy of Zoroaster revived by the Manichæans, is the principle of evil, which at last will be totally vanquished by Oromades, the author of good

**ARIMANNI**, in antiquity, the denomination of a class of persons employed in agriculture in the middle ages, who were free men

**ARIMATHÆA**, or **RAMATHA**, a city of Palestine, placed by Jerome between Lidda and Joppa, but M d'Anville places it a little to the south-east of Lidda and Diaspolis Modern travellers speak of a city called Ramatha, between Joppa and Jerusalem

**ARIMINUM**, now Rimini, a city of Italy, near the river Rubicon

**ARIOLATION** *s* (*harrolus*, I t) Sooth-saying, vaticination (*Brown*)

**ARIOLI**, in antiquity, a kind of prophets, or religious conjurers, who by abominable prayers, and horrible sacrifices at the altars of idols, procured answers to their questions concerning future events

**ARION**, in fabulous history, a celebrated horse, more famous in poetic history than Bucephalus in the history of Alexander Authors speak variously of his origin, though he is generally allowed to have been produced by Neptune, and nursed by the Nereids Hercules mounted him when he took the city of Elis, and he won the prize for racing at the Nemean games

**ARIOSIO** (Ludovico or Lewis,) a celebrated Italian poet, born of a noble family, at the castle of Reggio, in Lombardy, in the year

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1474 He translated several pieces out of French and Spanish into Italian, wrote seven satires and five comedies, but his Orlando Furioso, which he began when he was about thirty years of age, is the most celebrated of all his works Passing one day by a potter's shop, he heard the potter uttering a stanza out of the Orlando Furioso, which he pronounced in so bad a manner, that Ariosto being vexed, broke with his stick several of the pots which stood exposed to sale The potter expostulated with him in very severe terms, for injuring a poor man who had never injured him "Yes, you have, said Ariosto, and I have not yet sufficiently revenged myself upon you for the injury you have done me to my face you have broken and mangled a stanza of mine, worth a mark of gold" He was however of an affable, easy, and condescending temper His attachment to poetry did not prevent his engaging in public affairs, for he was employed in embassies and negotiations in different parts of Italy He died at Ferrara on the 8th of July 1559 His Orlando Furioso has been translated into English first, by sir John Harrington, in 1634, folio, and again by the ingenious Mr Hoole, in 1783, 8vo

**ARISBÆ**, a city of Troas in Asia Minor, a colony of the Mitylenians

**To ARISE** *v n* pret *arise*, particip *arisen*

1 To mount upward as the sun (*Dryden*) 2

To get up as from sleep, or from rest (*Isd*) 3

To come into view, as from obscurity (*Matthew*) 4

To revive from death (*Isaiah*) 5

To proceed, or have its original (*Dryden*) 6

To enter upon a new station (*Cowley*) 7

To commence hostility (*Samuel*)

**ARISTA** (from *arisah*, Arab) The beard of corn

**ARISTÆUS**, in fabulous history, the son of Apollo and Cyrene, was born in Lybia, and brought up by the Nymphs He married Autonoe, the daughter of Cadmus, by whom he had Actæon It is also said that he found out the art of extracting honey, and making oil and cheese; and that for his services to mankind, the Gods placed him among the stars, where he is the Aquarius of the Zodiac

**ARISTARCHUS**, a celebrated Greek astronomer and philosopher, was born at Samos, and flourished about the middle of the third century before Christ Aristarchus is well known to have maintained the modern opinion with regard to the motion of the earth round the sun, and its revolution about its own centre or axis He also taught, that the annual orbit of the earth is but merely as a point, compared with the distance of the fixed stars His method of determining the distance of the sun from the earth, was by means of the dichotomy of the moon (see *DICHOTOMY*), and in this way he concluded, that it contained at least eighteen or twenty times that of the moon from the earth Aristarchus likewise found by methods, the detail of which would be too tedious, that the diameter of the moon bears a greater proportion to that of the earth than that of 43 to 108, but less than that of 19 to

60, so that the diameter of the moon, according to his statement, should be somewhat less than a third part of that of the earth. He also estimated the apparent diameter of the sun at the 720th part of the zodiac. Besides his astronomical discoveries, Aristarchus invented a peculiar kind of hemispherical sun dial, mentioned by Vitruvius, b ix c 9. The only work of this ancient astronomer now extant is a treatise "On the Magnitude and Distances of the Sun and Moon," first published by Villus, at Venice, fol in 1498, afterwards by Wallis, with his own notes and Commandine's version, at Oxford, in 1683, 8vo, and again in Wallis's works, vol III.

ARISTARCHUS, the next most celebrated of this name, was a grammarian of Samos. He was famous for his critical powers, and he revised the poems of Homer with such severity, that ever after all severe critics were called Aristarchi. He wrote above 800 commentaries on different authors, much esteemed in his age (*Her.*) &c.

ARISTEA. In botany, a genus of the class and order triandria, monogynia petals six, style declined, stigma funnel-form, gipping, capsule inferior, many seeded. The only species is a low plant of the Cape, with narrow veined leaves, and flowers in downy heads.

ARISTIDES. Among the many recorded of this name by ancient writers, no one was so celebrated as an Athenian, son of Lysimachus, in the age of Themistocles, whose great temperance and virtue procured him the surname of Just. He was rival to Themistocles, by whose influence he was banished for ten years, B C 484, but before six years had elapsed, he was recalled. He was at the battle of Salamis, and was appointed chief commander with Pausanias against Mardonius, whom they defeated at Platæa. He died so poor, that the expences of his funeral were defrayed at the public charge. His two daughters, on account of their father's virtues, received a dowry from the public treasury when they were come to marriageable years. He was eminently conspicuous for his moral goodness. When he sat as judge, it is said that the plaintiff, in his accusation, mentioned the injuries his opponent had done to Aristides. "Mention the wrongs you have received," replied the equitable Athenian—"I sit here as judge, and the lawsuit is yours, and not mine." C Nep & Plut in Vita.

ARISTIPPUS of Cyrene, disciple of Socrates, and founder of the cyrenaic sect, differed widely from the doctrine of his master. His maxim was, that pleasure is the chief good of man. Dionysius the tyrant entertained him at his court, where Aristippus revelled in luxury. The tyrant once asked him how it was that the philosophers always sought the company of the great, whereas the latter seldom visited philosophers? to which he replied, "Because the physicians usually go to the sick." Diogenes once said to him, "If Aristippus

could be content to live upon vegetables, he would not demean himself in courting the favour of princes, to which he replied "If he who censures me were qualified to pay his court to princes, he would not live on vegetables." A person boasting before him that he had read a great deal, Aristippus remarked, "that it was no sign of good health to eat more than one can digest." He flourished about 400 B C.

ARISOBRATHRA, in ancient geography, a town of India, on this side of the Ganges (*Ptolemy*).

ARISTOCRACY, a form of government where the supreme power is vested in a body of nobles or principal persons of the state. The word is derived from *aristos* *optimus*, and *agoras* *imperio*, *I govern*. Ancient writers on politics prefer the aristocratical form of government to all others, but with little reason, as it is a form of government, in fact, the least favourable to liberty of any. The republic of Venice is a striking instance of this.

ARISTOCRATICAL *a* (from *aristocracy*) Relating to aristocracy (*Ayliffe*).

ARISTOCRATICALNESS; (from *aristocratically*) An aristocratically state.

ARISTOLOCHIA, (*aristolochia*, from *aristos*, *good*, and *λογια* or *λογια*, *parturition*, so called because it was supposed to be of sovereign use in disorders incident to child birth.) Birthwort. A genus of the class and order gynandria, hexandria. Stigma six, calyxless, corol one-petalled, tubular, tongue shaped, capsule inferior, six-celled. Twenty-seven species, chiefly American or of the South of Europe.

1 A long. In medicine, long rooted birthwort. *Aristolochia folius cordatis petiolatis integerrimis obtusiusculis, caule infirmo, foliis solitariis*. The root of this plant only is in use, it possesses a somewhat aromatic smell, and a warm bitterish taste, accompanied with a slight degree of pungency. The virtues ascribed to this root by the ancients were very considerable, and it was frequently employed in various diseases, but particularly in promoting the discharge of the lochia, hence its name. It is now very rarely used except in gouty affections, as an aromatic stimulant.

2 A *anguicida*. Snake-killing birthwort. The juice of the root of this plant, *aristolochia anguicida, folius cordatis, acumina is, caule volubili, fruticoso, pedunculis solitariis, stipulis cordatis*, of Linnaeus, has the property of so stupefying serpents, that they may be handled with impunity. One or two drops are sufficient, and if more be dropt into the mouth they become convulsed. So ungrateful is the smell of the root to those reptiles, that it is said they immediately turn from it. The juice is also esteemed as a preventive against the effects usually produced by the bite of venomous serpents.

3 A *clematitis* (Called *clematitis*, *κλεμνις*, *malldis*, from *κλεμναι*, *a tendril*, from its climbing up trees or any thing it can fasten upon with its tendrils.) This plant is the aristo-

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*Ipechua vulgaris* of the pharmacopœia. See **ARISTOLOCHIA VULGARIS**.

4 **A rotunda** The root of this species, *aristolochia rotunda* foliis cordatis, subsessilibus, obtusis, caule inferius, floribus solitariis, of Linneus, is used indiscriminately with that of the *aristolochia longa*. See **ARISTOLOCHIA**.

5 **A serpentaria** This plant is the *serpentaria virginiana* of the pharmacopœias. See **SERPENTARIA VIRGINIANA**.

6 **A trilobata** Three-lobed birthwort. The root and every part of this plant, *aristolochia trilobata*, solis trilobis, caule volubili, floribus maximis, is diuretic, and is employed in America against the bite of serpent.

**ARISTOLOCHIA VULGARIS** *Aristolochia tenuis*. An extinct species of this species, *aristolochia clematitis*, foliis cordatis, caule erecto, floribus nullibus confertis of Linneus, by the Weymouth pharmacopœia, and the plant is returned in that of Edinburgh. It is esteemed as possessing antipodagric virtue.

**ARISTOLOCHIA FABACEA** The root of this plant, *Fumaria bulbosa*, caule simplici, bracteis longitudine florum, of Linneus, was formerly given to restore suppressed menses, and is an anthelmintic. See **FUMOSA**.

**ARISTOPHANES**, an Athenian comic poet, was contemporary with Socrates, Plato, and Euripides. He attacked the deities of those who aimed at the sovereign power at Athens with such success, that he was liberally rewarded by his fellow citizens for his patriotic exertions. His descriptions of the manners of the Athenians were so faithful, that when Dionysius the tyrant wrote to Plato for an account of the state and language of that country, he sent him the plays of Aristophanes. Of all his pieces there are only eleven extant. The *Clouds* was written with the express view of ridiculing Socrates, who had taken contempt for the comic poets, and to the eternal dishonour of the Athenians, they applauded the poet and persecuted the philosopher. The time of his death is uncertain. The best edition of this writer are those of Kuster, Beigler, Brunck, and Peter Burman, junr. An English translation of *The Clouds*, has been lately published by Mr Cumberland. The very best edition of Aristophanes is Brunck's of 1783 in 4 vols. Gr and Lat with many notes and emendations.

**ARISTOTELIA**, in antiquity, annual festivals celebrated at Stagyræ, in honour of Aristotle.

**ARISTOTELIA** In botany, a genus of the class an order dodecandria, monogynia. Calyx five-leaved, petals five, style three cleft, berry three celled, with two seeds in each. The only species is a native shrub of Chili, with white flowers and ever green leaves.

**ARISTOTELIAN PHILOSOPHY**, the philosophy taught by Aristotle, and maintained

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by his followers. The Aristotelian is otherwise called the Peripatetic Philosophy. See **PERIPATETICS**.

**ARISTOTELIANS** a sect of philosophers, otherwise called Peripatetics, whose dogmata prevailed for a long while in the schools, even in spite of the Cartesian, Newtonians, and other corpuscularians. But the systems of the latter have at length gained the pre-eminence, and the Newtonian philosophy in particular is now very generally received. The principles of Aristotle's philosophy, the learned Greeks, are chiefly laid down in the four books de Cœlo, the eight books of Physical Audition, *Physica audientia*, belonging rather to logic or metaphysics than to physics. Instead of the more ancient systems, he introduced matter, form, and privation as the principle of all things, but he does not seem to have derived much benefit from them in natural philosophy. The reader will find a distinct account of the logical part of his philosophy, by Dr Reid in Lord Kames's Sketches of the History of Man, and Mr Harris has published a sensible commentary on his Categorical under the title of Philosophical Arrangement.

**ARISTOTELICA ROTULA** See **ROTA**.  
**ARISTOTELI**, a famous philosopher, son of Nicomachus, a physician at Iestrida, born at Stagyræ. After his father's death he went to Athens to hear Plato's lectures, where he soon signified himself by the brilliancy of his genius. After he had spent 20 years in hearing the instructions of Plato, he opened a school for himself, for which he was accused of ingratitude and illiberality by his ancient master. He was moderate in his meals and slept little. He was 10 years preceptor to Alexander, who received his instructions with deference and always respected him. Diogenes Laertius is given us every extant catalogue of his writings. He has been called by Plato the philosopher of truth, and Cicero compliments him with the title of man of eloquence, universal knowledge, readiness and acuteness of invention and fecundity of thought. He was so authoritative in his opinions, that, as Bacon observes, he wished to establish the same dominion over men's minds, as his pupil over nations. Aristotle's logic long reigned in the schools, and has been regarded as the perfect model of all imitation. As he expired, the philosopher is said to have uttered the following sentiment, "Ecce hunc mundum intueor, anxius vivi, perturbatus egredior, cunctis cunctis miseretur mei." The letter which Philip wrote to Aristotle has been preserved, and is in these words: "I inform you I have a son, I think the gods, not so much for making me a father, as for giving me a son in an age when he can have Aristotle for his instructor. I hope you will make him a successor worthy of me, and a king worthy of Macedonia." He died in the 63d year of his age, B C 322. It is said that he wrote 4000 books, not more than 20 of these, however, have come down to us. The beautiful and very excellent edition



of Aristotle by Theophilus Buhle (A D 1791,) exceeds in utility and typographical elegance all that have preceded it, though Sylburgius's edition of 1584 is very valuable and complete. For the editions of Aristotle's *Organon*, *Rhetorica Poetica* and *Ethica*, consult Didot's Introduction to the Classics.

ARISTOXENUS, the most ancient musical writer, of whose works any tracts have reached our times. He was born at Tarcentum, a city in that part of Italy called Magna Græcia, now Calabria. He was the son of a musician, whom some called Mnesias, others Spinthrus. He had his first education at Mantinea, a city of Arcadia, under his father, and I amyrus of Erythræ, he next studied under Xenophilus, the Pythagorean, and lastly under Aristotle, in company with Theophrastus. Suidas, from whom these particulars are transcribed, adds that Aristoxenus enraged at Aristotle having bequeathed his school to Theophrastus, trieduced him ever after. But Aristotle the Peripatetic, in Iuschnus, exculpates Aristoxenus in this particular, and assures us that he always spoke with great respect of his master Aristotle. From the preceding account it appears that Aristoxenus lived under Alexander the Great and his first successors. His *Hymnics* in three books, all that are come down to us, together with Ptolemy's *Hymnics*, were first published by Gouvinus but not very correctly at Venice 1622, in 1to, with a Latin version John Meusius next translated the three books of Aristoxenus into Latin, from the MS of Jos Scaliger, but, according to Meibomius very negligently. With these he printed at Leyden, 1616, 4to. Nicomachus and Alpinus, two other Greek writers on music. After this Meibomius collected these musical writers together, to which he added Euclid Bæchius senior Aristides Quintilianus, and published the whole, with a Latin version and notes from the elegant press of Elsevir Amst 1632. The learned editor dedicates these ancient musical treasures to Christina queen of Sweden.

ARITHMANCY (αριθμομανία) and *μανία*) A foretelling future events by numbers.

ARITHMETIC, the art and science of numbers, or that part of mathematics which considers their powers and properties, and teaches how to compute or calculate truly, and with ease and expedition. It is by some authors also defined the science of discrete quantity. Arithmetic consists chiefly in the four principal rules or operations of Addition, Subtraction, Multiplication, and Division, to which may perhaps be added involution and evolution, or raising of powers and extraction of roots. But besides these for the facilitating and expediting of computations, mercantile, astronomical, &c many other useful rules have been contrived, which are applications of the former, such as, the rules of proportion, progression, allegation, false position, fellowship, interest, barter, rebate, equation of pay-

ments reduction, tare and tret, &c Besides the doctrine of the curious and abstract properties of numbers.

The origin of Arithmetic is of the highest antiquity. Nothing, indeed, being more clear and familiar than the idea of number, the first men must have counted their fingers, their cattle, their days their trees, &c, and it is plain that the formation of societies and the possession of property suppose the necessity of calculation. The Phœnicians, who were the first and the most skilful merchants in the world, probably extended the limits of natural arithmetic by inventing signs and compendious processes. And in this sense, they may be regarded as the first arithmeticians. But we may safely say it is fabulous the opinion of those who tell us that Phœnix the son of Agenor first wrote an arithmetic in the Phœnician language. All the nations of which we have any knowledge (except the ancient Chinese, and a people in China mentioned by Aristotle) have chosen the same system of numeration, namely the decuple progression, and represent number by the letters of their alphabets. The different kinds of ten were distinguished, either by accents which affected the numeral letters, among the Greeks, or by different combinations of the numeral letters, as among the Romans. These methods became very complicated and therefore very inconvenient, when the numbers were considerable. The ingenious system of numeration, which forms the basis of our modern arithmetic, was long familiar to the Arabians, before it penetrated into our quarter of the world. But the honour of the original invention appears to belong to the Indians. For Alsephidi, an Arabian author, says that the Indians boasted of three things, namely, the book intitled *Golilla vedamini* (a kind of fables) the method of calculation, and the game of chess. And Abun-Rigel, an Arabian author of the 13th century, expressly ascribes the invention of this scheme of arithmetic to the Indian philosophers. It is true that some Pythagoreans employed nine particular characters in their calculations, while others used the letters of the alphabet, which were the ordinary signs, and it appears certain that a mode of notation resembling ours was known in the school of Pythagoras. But it is more natural to suppose that Pythagoras learned this invention from the Indians, than that they owed it to the Greek. It is said, that that philosopher carried the combinations of numbers very far, and that he attached mysterious powers to certain properties of those combinations. But this is conjectural. All that he could have written on the subject of numbers is lost, and time hath only respected his multiplication table, which we still use. In whatever manner the arithmetic which originated in India became known to the Arabians, it is to this last people that we immediately owe that art, and it was not till the year 960 or 970, that it was transmitted to the western

# ARITHMETIC.

Christians by the famous Gerbert, whose merit and wisdom afterwards elevated him to the papal chair, under the name of Sylvester II. The form of the arithmetical characters has undergone some change. The figures used by Alsephadi and Boetius, were almost all different from ours. But those of Sacro Bosco and Roger Bacon in the 13th century, had a great resemblance to those used at the present day. The Arabians enriched arithmetic with some curious rules, particularly single and double position. The ancient arithmetic, however, fell far short of that of the moderns. Decimals, which were introduced by Regiomontanus, simplified the management of fractions, and completed our system of numeration. Circulating, or repeating, decimals, were first taken notice of by Dr Wallis, or, at least, he was the first who distinctly considered the subject. But the greatest and most useful discovery in arithmetic, that of the Logarithms by baron Napier, has carried the art, in all probability, to the utmost pitch of perfection, by simplifying and facilitating its most difficult and tedious operations. Monthly Mag vol xiii Keith's Arith.

From the time of Napier the authors on arithmetic have become very numerous, but the treatises which the student may consult with most advantage are those by Bonnycastle, Birks, English, Hutton, Vyse, and the excellent performance of Milcolm, which has long been a standard work both on the theory and the practice.

Arithmetic, under its present state, is variously divided into different kinds, theoretical, practical, instrumental, logarithmical, numerical, specious, decimal, dynamical, tetracteyal, duodecimal, sexagesimal, &c.

**ARITHMETIC, THEORETICAL**, is the science of the properties, relations, &c of numbers, considered abstractedly, with the reasons and demonstrations of the several rules. Such is that contained in the 7th, 8th, and 9th books of Euclid's Elements.

**Practical Arithmetic**, is the art or practice of numbering or computing that is, from certain numbers given, to find others which shall have any proposed relation to the former. As, having the two numbers 4 and 6 given, to find their sum, which is 10 or their difference, which is 2, or their product, 24, or their quotient,  $1\frac{1}{2}$ , or a third proportional to them, which is 9, &c.

**Specious Arithmetic** See ALGEBRA.

**Binary or Dyadic Arithmetic**, is that in which only two figures are used, viz 1 and 0. See BINARY.

**Common or Vulgar Arithmetic**, is that which is concerning integers and vulgar fractions.

**Decimal or Decadal Arithmetic**, is that which is performed by a series of ten characters or figures, the progression being ten-fold, or from 1 to 10s, 100s, &c, which includes both integers and decimal fractions, in the common scale of numbers, and the characters

used are the ten Arabic or Indian figures 0, 1, 2, 3, 4, 5, 6, 7, 8, 9.

**Fractional Arithmetic, or of fractions**, is that which treats of fractions, both vulgar and decimal.

**Harmonical Arithmetic**, is so much of the doctrine of numbers, as relates to the making the comparisons, reductions, &c of musical intervals.

**Arithmetic of Infinites**, is the method of summing up a series of numbers, of which the number of terms is infinite. This method was first invented by Dr Wallis, is appears by his treatise on that subject, where he shews its uses in geometry, in finding the areas of superficies, the contents of solids, &c. But the method of fluxions, which is a kind of universal arithmetic of infinites, performs all these more easily, as well as a great many other things, which the former will not reach.

**Instrumental Arithmetic**, is that in which the common rules are performed by instruments, or some sort of tangible or palpable substance, as sliding rules, &c.

**Palpable Arithmetic**, a name given by Dr Saunderson, who was blind, to an ingenious apparatus by which he was enabled to perform arithmetical operations. See the article BLIND.

**Integral Arithmetic, or of integers**, is that which respects integers, or whole numbers.

**Literal or Algebric Arithmetic**, is that which is performed by letters, which represent any numbers indefinitely.

**Logarithmical Arithmetic**, is performed by the tables of logarithms.

**Political Arithmetic**, is the application of arithmetic to political subjects, such as, the strength and revenues of nations, the number of people, births, burials, &c.

**Sexagesimal or Sexagenary Arithmetic**, is that which proceeds by sixties, or the doctrine of sexagesimal fractions a method which, it is supposed, was invented by Ptolemy, in the 2d century, at least they were used by him.

**Tabular Arithmetic**, is that in which the operations of multiplication, division, &c are performed by means of tables calculated for that purpose, such as those of Herwart, in 1610, and Hutton's tables of powers and products, published by order of the commissioners of longitude, in 1781. By means of these tables, a tolerable arithmetician may extract the cubic or higher roots, to 10 places of decimals, in 5 or 6 minutes.

**Tetractis Arithmetic**, is that in which only the four characters 0, 1, 2, 3 are used. A treatise of this kind of arithmetic is extant, by Erhard or Erhard Weigel.

**Universal Arithmetic**, is the name given by Newton to the science of algebra, of which he left at Cambridge an excellent treatise, being the text book drawn up for the use of his lectures, while he was professor of mathematics in that university.

# ARITHMETIC

**ARITHMETIC** being the science of computing by numbers, is comprehended in the two general operations of increasing and diminishing. The fundamental rules applied to the former are, **ADDITION** and **MULTIPLICATION**, and to the latter, **SUBTRACTION** and **DIVISION**. *Notation and Numeration* being only preparatory to these

## NOTATION

Is the expressing of any number in writing, either by words or figures. The characters by which numbers are now generally denoted are the ten following, with their simple values

1, 2, 3, 4, 5, 6, 7, 8, 9, 0  
one two three four five six seven eight nine cipher  
Beside the values here assigned to the first nine of these characters or figures, they have other values, arising from the situations in which they stand relative to each other when used to express any number greater than nine, as in the following

1	2	3	4	5	6	7	8	9	0
Units	Tens	Hundreds	Thousands	Tens of Thousands	Hundreds of Thousands	Millions	Tens of Millions	Hundreds of Millions	Billions

From this it is evident, that the relative values of figures increase in a decuple or tenfold proportion for every place they are removed from that of units towards the left hand, for the first 2 on the right hand expresses only its simple value or two units, but the second denotes two tens, or ten times the value it would have expressed in the first place, the third signifies two hundreds, or its first value a hundred, and its second ten times repeated, the fourth is expressive of thousands, &c. Thus 2222 taken together, denote two thousand two hundred and twenty-two.

The above number is sufficiently extensive for common purposes, but, as greater numbers sometimes occur, it may be proper to observe that if they be divided into periods of six figures each, beginning at the right-hand, the first period is units, the second millions, the third billions, the fourth trillions the fifth quadrillions, &c. When numbers are further divided into half periods of three figures each, it adds much to the facility of reading large numbers.

The cipher has no value of its own, but increases that of other figures when placed on the right of them, by removing them farther from the unit's place, thus, 50 denotes fifty and 500, five hundred. It is also used to fill up the place or places in a number where no value is expressed, so five hundred and five (there being no tens) is denoted by 505, and four thousand and seven (where neither hundreds nor tens occur) by 4007, and the number forty thousand six hundred and seven, is written 40,607.

## ROMAN NOTATION

The Romans made and recorded their calculations by means of seven numeral letters, which with their values are as follow

I, V, X, L, C, D, M  
1, 5, 10, 50, 100, 500, 1000

The intermediate and greater numbers they formed by different combinations of these seven. When the letter which denoted the greater value stood on the left-hand the number was expressed by their sum, as LX, sixty, but when on the right, by their difference, as XL, forty.

A line drawn horizontally over any letter, increased its value a thousand fold, as  $\overline{C}$  expressed a hundred thousand,  $\overline{M}$ , a million. For 500 they also wrote IJ and the addition of every J increased the former value in a decuple proportion, so IJJ was 5000, and IJJJ, 50 000. A thousand was likewise denoted by CIIJ, and its value increased 74 in the last method by adding C and J, thus CCIIJ equalled 10 000.

The following columns will be of service in attaining this notation by which chapters, sections, and dates of books are frequently expressed

I 1,	X 10,
II 2,	XX 20,
III 3,	XXX 30,
IV, 4,	XI, 40,
V, 5,	I 50,
VI 6,	LX 60,
VII, 7,	LXX 70,
VIII, 8,	LXXX 80,
IX 9,	XC 90,

The intermediates of these are formed by writing each of the numbers in the left-hand column respectively on the right-hand side of each in the right-hand column,

as XI, 11, XII, 12, &c. XXI, 21, XXII, 22, &c.

## NUMERATION

Is the reverse of Notation, or the reading of numbers and this is done by using the words which they denote, as shown above. Thus, 1808 is read one thousand eight hundred and eight.

The rules of addition subtraction multiplication, and division are both simple and compound as they relate to quantities of one or more denominations.

## SIMPLE ADDITION

Consists in collecting two or more numbers of the same denomination into one sum or total, which is done as follows

The character denoting addition is +, named plus.

**RULE** Write the numbers under each other, units under unit, tens under tens. &c. add up the column of units, and beneath it set the right hand figure of the sum, carrying the rest, if any, to the next column, which add up and set down as before, and so on to the last column to the left hand, the whole sum of which must be put down. Then will this new number be the sum of all the others, as was required.

## EXAMPLES

34786	498637
17248	332786
39677	792384
11003	167842
93704	674030
64071	368694

260449 sum

283437 sum

**PROOF** Add up all but the top number, which being afterwards added to the sum of the others, will make it the same as that found before if the

# ARITHMETIC

work be right, or begin at the top and add downwards

## SIMPLE SUBTRACTION

Consists in finding the difference between two numbers of the same denomination. The character by which subtraction is denoted is called minus —

**RULE** Write the numbers under each other as in addition, the less under the greater. Begin with the units, and take each figure in the lower number from that above it, and set down the remainder as in addition. When any figure in the lower line is greater than that above it, suppose ten to be added to the upper one, and having taken the bottom figure from this sum, and set down the remainder as before. Carry one to the next lower figure on the left, and so on through the whole number, which will give the difference required.

**PROOF** Add this difference to the less number, and the sum will be equal to the greater when the work is right.

### EXAMPLES

37869473	78674216
18693204	49056432
19176269 diff	29587784 diff

## SIMPLE MULTIPLICATION

Consists in obtaining the amount of any simple number, taken as many times as there are units in another proposed number, and is therefore, only a compendious method of performing simple addition. Or multiplication may be defined as in algebra. The character for multiplication is X.

The number multiplied is called the multiplicand, that by which it is multiplied, the multiplier, and the one obtained by the multiplication, the product.

MULTIPLICATION TABLE

1	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3	6	9	12	15	18	21	24	27	30	33	36
4	8	12	16	20	24	28	32	36	40	44	48
5	10	15	20	25	30	35	40	45	50	55	60
6	12	18	24	30	36	42	48	54	60	66	72
7	14	21	28	35	42	49	56	63	70	77	84
8	16	24	32	40	48	56	64	72	80	88	96
9	18	27	36	45	54	63	72	81	90	99	108
10	20	30	40	50	60	70	80	90	100	110	120
11	22	33	44	55	66	77	88	99	110	121	132
12	24	36	48	60	72	84	96	108	120	132	144

### CASE I When the multiplier does not exceed 12

**RULE** Having set the multiplier under the unit's place of the multiplicand, multiply each figure of the latter by the former, set the right-hand figure of each product under the figure multiplied, and carry the rest, if any, to the next product, the result will be the whole product required.

**NOTE** When the multiplier is any number between 11 and 20, multiply by the unit's figure, and in the product the figure which stands on the

right of that multiplied, and to the tens in the product of the last figure, add the figure itself, and the whole product will be obtained in one line.

**PROOF** Change the multiplier into the multiplicand, and the contrary, and the product will agree with the former when the work is right.

### EXAMPLES

Multiplicand	93478604	47864073
Multiplier	8	18
Product	747828832	8615528514

### CASE II When the multiplier consists of several figures

**RULE** Multiply by each figure separately, setting the first figure of each product under the figure multiplied by, and add the several products together, then their sum will be the whole product.

### EXAMPLES

314786	4780483
375	5073
1573730	14341449
2203302	33463381
944358	23902415
118044750	24251390259

### CASE III When the multiplier is the product of any two numbers not exceeding 12

**RULE** Multiply by one of the numbers first, and then this product by the other, which will give the whole product required.

**NOTE** If there be cyphers on the right of either the multiplicand or multiplier, or both, find the product of the other figures by one of the preceding rules, and to the right of it annex as many cyphers as were omitted.

### EXAMPLES

748321 x 42	8704600 x 7-0
7	9
5238247	783414
6	
31429482	6267312000

## SIMPLE DIVISION

Is a compendious method of finding how often the less of two simple numbers is contained in the greater, and consequently is only a ready way of performing subtraction. The character denoting division is — See Division in ALGEBRA.

The number to be divided is called the dividend, that to be divided by, the divisor, and the number of times the former contains the latter, the quotient. There is frequently a remainder after the division is finished, and which must always be less than the divisor.

### CASE I When the divisor does not exceed 12

**RULE** Write the divisor on the left hand side of the dividend, separating them by a small curve line. Find how many times it is contained in as many of the left hand figures of the dividend as are necessary, and set the number under the right hand figure used, then carry the remainder, if any, as so many tens to the next dividend figure, and divide the sum as before, and so on to the unit's place of the dividend. Observe, that there must be a quotient figure under every one of the dividend to the right of that under which the first quotient figure stands, and if no significant figure

# ARITHMETIC

Occur its place must be supplied by a cipher, also if there be any remainder it must be set on the right of the quotient, with the divisor under it and a small line between them

**PROOF** Multiply the quotient by the divisor, and the remainder added to the product will give the dividend

$$\begin{array}{r} \text{Ex I } 8)786349 \\ 98293\frac{1}{2} \end{array} \quad \begin{array}{r} \text{Ex II } 12)12479041 \\ 3206586\frac{1}{2} \end{array}$$

**CASE II** When the divisor consists of several figures

**RULE** Set the divisor on the left-hand of the dividend as before and let the quotient be placed in a similar manner on the right. Multiply the divisor by the first figure of the quotient found as above and set the product under the left hand figures of the dividend from which subtract it, and to the right of the remainder annex the next figure of the dividend find another figure of the quotient and so on until all the figures of the dividend are used

**NOTE** If there be ciphers on the right hand of the divisor cut them off, and omit the same number of figures on the right of the dividend. Then divide as above, and annex the figures omitted to the right hand of the remainder after the division is finished for the true remainder

$$\begin{array}{r} \text{Ex I } 574)761141040 \\ 748 \\ \hline 1521 \\ 1496 \\ \hline 254 \text{ rem} \end{array}$$

$$\begin{array}{r} \text{Ex II } 783,00)567,111(-2 \\ 5481 \\ \hline 217 \\ 1466 \\ \hline 67111 \text{ rem} \end{array}$$

**CASE III** When the divisor is the exact product of two numbers not exceeding 12

**RULE** Divide by one of the numbers first and then the quotient by the other. And, in order to obtain the true remainder, multiply the last remainder by the first divisor, and the first remainder being added to the product will give the true one

**NOTE** The method is not confined to two numbers but when there are more finding the true remainder is considered as too complicated an operation for this place

$$\begin{array}{r} \text{Ex } \text{Let } 74694 \text{ be divided by } 42 \\ 6)746948 \\ 7)124491-2 \text{ and } \left\{ \begin{array}{l} 18 \\ 2 \\ \hline 20 \text{ true rem} \end{array} \right. \\ 17784-3 \end{array}$$

## REDUCTION

Is the operation by which quantities are brought from one name or denomination to another without changing their value, and is principally used for money, weights, and measures, for tables of which, see **WEIGHTS AND MEASURES**

**RULE** Quantities are brought from a higher denomination to a lower by multiplying by as many of the lower as make one of the higher—

from a lower to a higher by dividing by as many of the former as make one of the latter

**Ex I** Reduce 57l 7s 4d into pence

$$\begin{array}{r} 57 \\ \times 20 \\ \hline 1147 \text{ shillings} \\ 12 \\ \hline 13768 \text{ pence} \end{array}$$

**II** Bring 497386 farthings into crowns

$$\begin{array}{r} 4)497386 \\ 12)124346-2 \\ 5)10362-2 \\ \hline 2072 \text{ 2s } 2\frac{1}{2}d \text{ ans} \end{array}$$

## COMPOUND ADDITION

Is the collecting of several quantities of diff rent denominations into one sum or total quantity

**RULE** Place the numbers so that those of the same denomination may stand directly under each other and draw a line below them. Add up the figures in the lowest denomination, and find, by reduction, how many units, of the next higher denomination, are contained in their sum. Set down the remainder below its proper column and carry those units to the next denomination which add up in the same manner as before. Proceed thus through all the denominations, to the highest whose sum together with the several remainders, will give the answer sought

The method of proof is the same as in simple addition

$$\begin{array}{r} \text{Ex I } \begin{array}{r} \text{£} \quad \text{s} \quad \text{d} \\ 34 \quad 15 \quad 2\frac{1}{2} \\ 27 \quad 12 \quad 9\frac{1}{2} \\ 30 \quad 9 \quad 11\frac{1}{2} \\ 79 \quad 15 \quad 4\frac{1}{2} \\ \hline 172 \quad 13 \quad 3\frac{1}{2} \end{array} \quad \text{Ex II } \begin{array}{r} \text{£} \quad \text{s} \quad \text{d} \\ 51 \quad 18 \quad 9\frac{1}{2} \\ 15 \quad 9 \quad 11\frac{1}{2} \\ 76 \quad 4 \quad 9 \\ 59 \quad 19 \quad 7\frac{1}{2} \\ \hline 203 \quad 13 \quad 1\frac{1}{2} \end{array} \end{array}$$

$$\begin{array}{r} \text{Ex III } \begin{array}{r} \text{lb} \quad \text{oz} \quad \text{d} \quad \text{gr} \\ 54 \quad 9 \quad 17 \quad 15 \\ 97 \quad 8 \quad 15 \quad 7 \\ 41 \quad 3 \quad 19 \quad 23 \\ 88 \quad 11 \quad 7 \quad 16 \\ \hline 282 \quad 10 \quad 0 \quad 10 \end{array} \end{array}$$

## COMPOUND SUBTRACTION

Is the operation by which the difference of two quantities of several denominations is found

**RULE** Place the less number under the greater, so that like denominations may stand under each other, and proceed as in simple subtraction, observing only that when the lower number exceeds that above it, as many must be added to the latter as make one in the next column to the left

**PROOF** The method of proof is the same as in simple subtraction

$$\begin{array}{r} \text{Ex I } \begin{array}{r} \text{£} \quad \text{s} \quad \text{d} \\ 79 \quad 17 \quad 8\frac{1}{2} \\ 35 \quad 12 \quad 4\frac{1}{2} \\ \hline 44 \quad 5 \quad 4\frac{1}{2} \\ 79 \quad 17 \quad 8\frac{1}{2} \end{array} \quad \text{Ex II } \begin{array}{r} \text{£} \quad \text{s} \quad \text{d} \quad \text{p} \\ 103 \quad 3 \quad 2\frac{1}{2} \\ 71 \quad 12 \quad 5\frac{1}{2} \\ \hline 31 \quad 10 \quad 8\frac{1}{2} \\ 103 \quad 3 \quad 2\frac{1}{2} \end{array} \end{array}$$

# ARITHMETIC.

**Ex III.** *c grs lb*  
 $\begin{array}{r} 5 \text{ } 0 \text{ } 17 \\ 3 \text{ } 2 \text{ } 11 \end{array}$

5 0 17

## COMPOUND MULTIPLICATION

Consists in finding the amount of any number, of different denominations, taken any assigned number of times, and like simple multiplication admits of several cases

**CASE I** *When the multiplier does not exceed 12*

**RULE** Set it under the lowest denomination of the number to be multiplied, multiply the denomination immediately above it, and having ascertained the number of integers of the next higher denomination in the product, by the rule of reduction, set the remainder under the same denomination, and carry the integers to the product of the next higher denomination, and continue the same process unto the highest denomination, the whole product of which together with the several remainders, taken as one compound quantity, will be the whole product required

**PROOF** The same as in simple multiplication

**Ex** What is the value of 9 lb. of tea at 7s 9½d ?

$\begin{array}{r} 7s \text{ } 9\frac{1}{2}d \\ 9 \\ \hline \pounds \text{ } 3 \text{ } 10 \text{ } 1\frac{1}{2} \end{array}$

**CASE II** *When the multiplier exceeds 12, and is the product of small numbers*

**RULE** Multiply successively by its component parts instead of the whole number at once, as in simple multiplication

**Ex** 16 cwt of cheese at 11 18s 8d per cwt

7 14

301 18s 8d Answer

**CASE III** *If the multiplier cannot be produced by the multiplication of small numbers*

**RULE** Find the nearest to it, either greater or less, which can be so produced, then, multiply by the component parts as before, and for the odd parts, add or subtract according as is required

**Ex** 17 cells of holland, at 7s 8½d per ell

$\begin{array}{r} \pounds \text{ } 10 \text{ } 10 \\ \hline \text{ } \text{ } 4 \\ \hline 6 \text{ } 3 \text{ } 4 \\ 7 \text{ } 8\frac{1}{2} \\ \hline \pounds \text{ } 6 \text{ } 11 \text{ } 0\frac{1}{2} \end{array}$

## COMPOUND DIVISION

Is the operation by which any number, of different denominations, is divided into any required number of parts

**CASE I** *When the divisor does not exceed 12*

**RULE** Place the divisor on the left of the dividend, as in simple division —Begin at the left end, and divide each denomination by the divisor, setting down the quotients under their re-

spective dividends If there be any remainder after this division, reduce it to the next lower denomination, which add to the number, if any, belonging to that denomination, and divide the sum by the divisor Set down again this quotient, reduce its remainder to the next lower denomination again, and so on through all the denominations to the last

**PROOF** The same as in simple division

**Ex** Divide 225l 2s 4d by 2

$\begin{array}{r} \pounds \text{ } s \text{ } d \\ 2 \text{ ) } 225 \text{ } 2 \text{ } 4 \\ \hline \pounds \text{ } 112 \text{ } 11 \text{ } 2 \text{ the quotient} \end{array}$

**CASE II** *When the divisor exceeds 12, and is the product of small simple numbers*

**RULE** Divide by each of the numbers successively as in simple division

**Ex** What is sugar per cwt if 32 cwt cost 61l 17s 4d ?

$\begin{array}{r} \pounds \text{ } s \text{ } d \\ 8 \text{ ) } 61 \text{ } 17 \text{ } 4 \\ \hline 4 \text{ ) } 7 \text{ } 14 \text{ } 8 \\ \hline \pounds \text{ } 7 \text{ } 18 \text{ } 8 \text{ answer} \end{array}$

**CASE III** *When the divisor cannot be produced by the multiplication of small numbers*

**RULE** Divide by the whole divisor at once, as in Case II in Simple Division.

**Ex** Divide 224l 0s 6d by 51

51) 224l 0s 6d (4l 7s 10d quotient

$\begin{array}{r} 204 \\ \hline 20 \\ \hline 20 \\ \hline 7400 \\ \hline 357 \end{array}$

$\begin{array}{r} 43 \\ 12 \\ \hline 522 \\ 51 \end{array}$

## PROPORTION

Is that comprehensive branch of calculation which enables us to find a fourth quantity having a certain relation to three given quantities This rule, on account of its great and extensive usefulness, is oftentimes called The Golden Rule of Proportion, for, on a proper application of it and the preceding rules, the whole business of arithmetical, as well as every mathematical enquiry depends The rule itself is founded on this obvious principle, that the magnitude or quantity of any effect varies constantly in proportion to the varying part of the cause thus, the quantity of goods bought is in proportion to the money laid out, the space gone over by an uniform motion is in proportion to the time, &c It is usually divided into the three distinct parts or rules of DIRECT, INVERSE, and COMPOUND PROPORTION

The characters used to denote proportion are , and the terms are written thus 2 4 8 16, and read as 2 is to 4, so is 8 to 16

## DIRECT PROPORTION

Is employed in finding, from three given numbers,

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a fourth, which shall have the same relation to the third as the second has to the first,

Thus as 2 4 3 6,  
Or 4 2 6 3

**RULE** State the question, that is, place the terms so, that the first may be one of the terms of supposition, the second of the same nature as the fourth or term sought, and the third, the term of demand. Then bring the first and third terms into the same denomination, and the second to the lowest name mentioned. Multiply the second and third terms together, and divide the product by the first, and the quotient will be the answer in the same name as the second term, and which may be brought to any other denomination required.

**PROOF** The method of proof is by inverting the question, and in this manner each question will furnish four, and thus supply a very useful exercise.

**Ex** If 12lb of cheese cost 9s 6d what will 4 sheaves cost each weighing 19 6lb?

If 12lb 9s 6d 19 6lb x 4

12 33  
28 4

132  
114

528  
1452

15048

12 1254 pence

20 104 6

£ 5 4 6

## INVERSE PROPORTION

used when three quantities are given to find a fourth that shall have the same relation to the second as the first has to the third,

Thus 1 2 6 4 3  
or 4 3 2 6

**RULE** Set to the question, and reduce the terms as in direct proportion. Then multiply the first and second terms together, and divide the product by the third, and the quotient will be the answer as before.

**PROOF** Reverse the operation.

**Ex** An engineer having raised 100 yards of a certain work in 24 days with 5 men, how many must he employ to finish a like quantity of work in 15 days?

ds men ds men  
As 24 5 15 8

15 120 (8 Answer  
120

## COMPOUND PROPORTION

A rule in which more than three terms are given to find another, dependant upon them. This rule of general use, extending to all arithmetical relations where proportions are concerned it may be performed by means of the following directions.

1 Set down the terms expressing the conditions of the question, in one horizontal line, separating the producing terms from the produced, that is to say those which necessarily and jointly tend to produce or to modify any effect, and the constituent parts of such effect.

2 Under each conditional term, set its corresponding one in another line.

3 Multiply the producing terms of one line, and the produced terms of the other line, continually, and take the result for a dividend.

4 Multiply the remaining terms continually, and let the product be a divisor.

5 The quotient of this division, will be the term required.

**N B** In a question where a term is only understood, and not expressed it may always be represented by unity. The required term may be denoted either by Q or by an asterisk.

**Ex** 1 If 40 acres of grass be mowed by 8 men in 7 days how many acres can be mowed by 24 men in 28 days equally long?

M D A  
8 7 40  
24 28 X Q

$$Q = \frac{24 \times 28 \times 40}{8 \times 7} = 480 \text{ acres Answer}$$

**Ex** 2 If 48 men in 6 1/2 days of 12 hours long, dig a trench of 24 yards long, 2 deep, and 3 wide what length of trench of similar earth, 3 yards deep and 5 wide can be dug by 24 men in 180 days, of 10 hours long?

M Da H L De W  
48 6 12 24 2 3  
24 180 10 X Q 3 5

$$Q = \frac{24 \times 180 \times 10 \times 24 \times 2 \times 3}{48 \times 6 \times 12 \times 3 \times 5} = 120 \text{ yards Ans}$$

## PRACTICE

Is a compendious method of performing such questions in direct proportion as have unity for the first term, it obtained its name from being in daily use among merchants and tradesmen, as a ready and concise manner of answering most questions that occur in business.

An aliquot part of any number is such a part as being taken a certain number of times, will exactly make that number, thus 1/2 is an aliquot part of 1, and 2 of 6, for the former being taken 4 and the latter 3 times, make the numbers 1 and 6.

**GENERAL RULE** Suppose the price of the given quantity to be 1l or 1s as is most convenient, then will the quantity itself be the answer at the supposed price. Divide the given price into aliquot parts, either of the supposed price, or of another, and the sum of the quotients belonging to each will be the true answer required.

**PROOF** By direct proportion.

**Ex** What is the value of 526 yards of cloth, at 3s 10 1/2d per yard

526 Ans at 1l

3s 4d is 1/5 87 13 4 ditto at 0 3 4  
4d is 1/10 8 15 4 ditto at 0 0 4  
2d is 1/20 4 7 8 ditto at 0 0 2  
1/4 is 1/4 0 10 11 1/2 ditto at 0 0 0 1/2

101 7 3 1/2 ditto at 0 3 10 1/2

the full price

In the above example, it is plain that the quantity 526 is the answer at 1l, consequently,



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ety, or 87l 13s 4d. is the price of 3s 4d in like manner, as 4d is the  $\frac{1}{10}$  part of 3s 4d, so  $\frac{1}{10}$  of 87l 13s 4d or 8l 13s 4d is the answer at 4d. And by reasoning in this way 4l 7s 8d will be shewn to be the price at 2d and 10s 11 $\frac{1}{2}$ d. the price at  $\frac{1}{2}$ . Now as the sum of all these parts is equal to the whole price (3s 10 $\frac{1}{2}$ d.), so the sum of the answers belonging to each price will be the answer at the full price required. And the same will be true in any example whatever.

## VULGAR FRACTIONS

A fraction is an expression for part of a unit, and is denoted by two numbers placed one above another with a line between them, as  $\frac{1}{2}$  or  $\frac{1}{11}$ . The number below the line shows how many parts the integer is supposed to be divided into, and is called the denominator; that above it denotes the number of parts expressed by the fraction, and is called the numerator. The unit may represent a whole of any kind, and the parts into which it is supposed to be divided, are fractions of that whole.

It follows from the manner of representing fractions, that when the numerator is increased, the value of the fraction becomes greater, but, when the denominator is increased, the value becomes less. Hence we may infer, that if the numerator and denominator be both increased, or both diminished, in the same proportion, the value is not altered, and, therefore, if we multiply both by any number whatever, or divide them by any number which measures both, we shall obtain other fractions of equal value. Thus, every fraction may be expressed in a variety of forms, which have all the same signification.

Fractions are either proper, improper, simple, or compound.

When the numerator is less than the denominator the fraction is proper, and its value less than 1, as  $\frac{1}{2}$ . If the numerator be equal to or greater than the denominator, the fraction is improper, and its value is equal to or greater than 1, as  $\frac{3}{2}$  or  $\frac{11}{10}$ . A simple fraction has only one numerator and one denominator, as  $\frac{1}{2}$  or  $\frac{11}{10}$ . But a compound fraction has more than one numerator and denominator, or consists of several simple fractions, connected by the word of, as  $\frac{2}{3}$  of  $\frac{3}{4}$  of  $\frac{1}{2}$ .

A mixed number is composed of an integer and a fraction, as  $8\frac{1}{2}$ .

Besides the characters +, -, × and = already explained, and which greatly abbreviate the expressions in fractions there is commonly used ==, signifying equal to.

## REDUCTION OF VULGAR FRACTIONS

Consists in changing from one form to another, in order to render them more convenient for the operations of addition, subtraction, &c. and is usually distinguished into several cases.

### CASE I To reduce fractions to their lowest terms

**RULE** Since when both numerator and denominator of any fraction are diminished in the same ratio, its value is not changed, if both the terms be divided by any number that will exactly divide them and the operation continued until they have no common divisor but 1, the fraction will be in its least terms.

Ex Reduce  $\frac{1}{2}$  to its least terms

$$\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \frac{5}{10} = \frac{6}{12} = \frac{7}{14} = \frac{8}{16} = \frac{9}{18} = \frac{10}{20} = \frac{11}{22} = \frac{12}{24} = \frac{13}{26} = \frac{14}{28} = \frac{15}{30} = \frac{16}{32} = \frac{17}{34} = \frac{18}{36} = \frac{19}{38} = \frac{20}{40} = \frac{21}{42} = \frac{22}{44} = \frac{23}{46} = \frac{24}{48} = \frac{25}{50} = \frac{26}{52} = \frac{27}{54} = \frac{28}{56} = \frac{29}{58} = \frac{30}{60} = \frac{31}{62} = \frac{32}{64} = \frac{33}{66} = \frac{34}{68} = \frac{35}{70} = \frac{36}{72} = \frac{37}{74} = \frac{38}{76} = \frac{39}{78} = \frac{40}{80} = \frac{41}{82} = \frac{42}{84} = \frac{43}{86} = \frac{44}{88} = \frac{45}{90} = \frac{46}{92} = \frac{47}{94} = \frac{48}{96} = \frac{49}{98} = \frac{50}{100}$$

**NOTE** If the terms of the fraction are large numbers, the greatest common measure or number that will divide them both, may be found by dividing the greater by the less, and last divisor by the last remainder, and so on, till nothing remains, then the last divisor will be the greatest common measure required.

### CASE II To reduce an improper fraction to its equivalent whole or mixed number

**RULE** Divide the numerator by the denominator, and the quotient will be the answer.

Ex Reduce  $\frac{157}{10}$  to a whole or mixed number

$$\frac{157}{10} = 15 \frac{7}{10} = 15 \frac{7}{10}, \text{ answer}$$

### CASE III To reduce a mixed number to its equivalent improper fraction

**RULE** This operation is the reverse of the former therefore, multiply the whole number by the denominator of the fraction, and add the numerator to the product, then set that sum above the denominator for the fraction required.

Ex Reduce  $23\frac{1}{2}$  to a fraction

$$23\frac{1}{2} = \frac{(23 \times 2) + 1}{2} = \frac{47}{2}, \text{ the Answer}$$

### CASE IV To reduce a compound fraction to an equivalent simple one

**RULE** Multiply all the numerators together for the numerator and all the denominators together for the denominator of the fraction required.

When the same factors are found in both the terms, they may be struck out of each.

Ex Reduce  $\frac{1}{2}$  of  $\frac{3}{4}$  of  $\frac{1}{2}$  to a simple fraction

$$\frac{1}{2} \times \frac{3}{4} \times \frac{1}{2} = \frac{1 \times 3 \times 1}{2 \times 4 \times 2} = \frac{3}{16}$$

by cancelling 2 3 and 5 in both the terms the fraction becomes  $\frac{1}{4}$

### CASE V To reduce fractions of different denominators to equivalent fractions, having a common denominator

**RULE** Multiply each numerator by all the denominators except its own, for the new numerators, and multiply all the denominators together for a common denominator. When the given fractions are not simple ones, they must be reduced to such by the proper rules.

Ex Reduce  $\frac{1}{2}$  and  $\frac{3}{4}$  to a common denominator

$$1 \times 3 \times 4 = 12 \text{ the new numerator for } \frac{1}{2}$$

$$2 \times 2 \times 4 = 16 \text{ - - - ditto for } \frac{3}{4}$$

$$3 \times 2 \times 3 = 18 \text{ - - - ditto for } \frac{1}{2}$$

$$2 \times 3 \times 4 = 24 \text{ the common denominator}$$

Therefore the equivalent fractions are  $\frac{6}{12}$ ,  $\frac{12}{16}$ , and  $\frac{18}{18}$ . Or the whole operation of multiplying may be very well performed mentally, and only set down the results and given fractions thus  $\frac{1}{2}$ ,  $\frac{3}{4}$ ,  $\frac{1}{2}$ ,  $\frac{12}{16}$ ,  $\frac{18}{18}$ , by abbreviation.

**NOTES** 1 When the denominators of two given fractions have a common measure, divide them by it, and multiply the terms of each given fraction by the quotient arising from the other's denominator.

2 When the less denominator of two fractions exactly divides the greater, multiply the terms of that which has the less denominator by the quotient.

3 When more than two fractions are proposed it is sometimes convenient, first to reduce two of them to a common denominator, then these and third, and so on, till they are all reduced to their least common denominator.

4 The value of fractions in parts of the integer may be found, as well as the operations of reduction, from one denomination to another, performed by the rules for compound division, and reduction of integers.

## ADDITION OF VULGAR FRACTIONS

**RULE** Reduce the proposed fractions to common denominator, if necessary, by the preceding rules, add the numerators together, and set their sum over the common denominator, and

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this fraction reduced as much as it will admit of, will be the answer

Ex Add  $\frac{1}{2}$ ,  $\frac{7}{8}$  and  $\frac{1}{4}$  of  $\frac{1}{2}$  together  
 $\frac{1}{2} + \frac{7}{8} + \frac{1}{4}$  of  $\frac{1}{2} = \frac{1}{2} + \frac{7}{8} + \frac{1}{8} = \frac{4}{8} + \frac{7}{8} + \frac{1}{8} = \frac{12}{8} = 1\frac{4}{8} = 1\frac{1}{2}$  ans

## SUBTRACTION OF VULGAR FRACTIONS

**RULE** Prepare the fractions as for addition, and at the difference of the numerators over the common denominator for the answer

Ex What is the difference between  $\frac{3}{4}$  and  $\frac{1}{2}$  of  $\frac{1}{2}$ ?

$\frac{3}{4}$  of  $\frac{1}{2} = \frac{3}{8}$ , and  $\frac{1}{2}$  of  $\frac{1}{2} = \frac{1}{4}$ ,  
 therefore  $\frac{3}{8} - \frac{1}{4} = \frac{3}{8} - \frac{2}{8} = \frac{1}{8}$  the required difference

## MULTIPLICATION OF VULGAR FRACTIONS

**RULE** Reduce the given numbers by the preceding rules if necessary, and multiply the numerator and denominators respectively together for the answer

Ex What is the continued product of  $4$ ,  $7\frac{1}{2}$ ,  $\frac{2}{3}$ ,

1st,  $4 = \frac{4}{1}$ , and  $7\frac{1}{2} = \frac{15}{2}$   
 Then,  $\frac{4}{1} \times \frac{15}{2} \times \frac{2}{3} \times \frac{1}{1} = \frac{4 \times 15 \times 2 \times 1}{1 \times 2 \times 3 \times 1} = \frac{120}{6} = 20$  the answer

## DIVISION OF VULGAR FRACTIONS

**RULE** Prepare the fractions as in multiplication, then divide the numerators by each other and also the denominators, if they will exactly divide, but if not invert the divisor and multiply the result by the dividend

Ex Divide  $\frac{19}{5}$  by  $\frac{2}{3}$  of  $\frac{1}{2}$

First  $\frac{19}{5}$  of  $\frac{1}{2} = \frac{19 \times 1}{5 \times 2} = \frac{19}{10}$ , and  $\frac{2}{3}$  of  $\frac{1}{2} = \frac{2}{6} = \frac{1}{3}$

Then  $\frac{19}{10} \div \frac{1}{3} = \frac{19 \times 3}{10 \times 1} = \frac{57}{10} = 5\frac{7}{10}$  the req quotient

**NOTE** Fractional questions in proportion are resolved by the same rules as those in whole numbers after reducing their terms by the preceding methods when necessary

## DECIMAL FRACTIONS

A decimal is a fraction, having always some power of 10 for its denominator, which consists of either 10, 100, 1000, &c denoting the number of equal parts into which the integer or whole is supposed to be divided, as,  $\frac{1}{10}$ ,  $\frac{1}{100}$ ,  $\frac{1}{1000}$ , &c. But, for the sake of brevity, the numerator only is expressed like a whole number with a point on the left of it, as 2, 02, 002, &c and which must always consist of as many figures as there are ciphers in the denominator, the places between the significant figures and the point being supplied with ciphers when necessary, as above. Consequently the same number of figures on the right of the decimal point has always the same denominator. Thus, the denominator of the fractions  $\frac{5000}{10000}$ ,  $\frac{0746}{10000}$ , is 10000. And hence it appears that the value of a decimal fraction is not altered by ciphers on the right hand, for  $\frac{5000}{10000}$  (or  $\frac{5000}{10000}$ ) when reduced to its lowest terms is the same as  $\frac{5}{10}$ , each being equal to  $\frac{1}{2}$ .

In mixed numbers the decimals are separated from the integers by the point thus,  $25\frac{7}{10}$  is written 25.7. It is also evident that the value of decimals decreases in the same tenfold proportion from the point towards the right hand, as that of integers increases towards the left.

## ADDITION AND SUBTRACTION OF DECIMALS

**RULE** Place the numbers so that the decimal points may stand directly under each other, then add, and subtract, as in whole numbers, setting

the point in the sum, or difference under the points above

Ex    32 035 136 374 160 63 12 3645 341 4035	from 13 348 take 9 2993 4 0487
--	--------------------------------------

## MULTIPLICATION OF DECIMALS

**RULE** Place the factors, and multiply them together the same as if they were whole numbers. Then point off in the product just as many places of decimals as there are decimals in both the factors. But if there be not so many figures in the product, then supply the defect by prefixing ciphers.

Ex Multiply 321096 by 2465	1605480 1926576 1284384 642192
-------------------------------	---

Ans 7991501640 the product.

**NOTE 1** When the multiplier is with any number of ciphers, as, 10, 100, &c the multiplication is performed by removing the decimal point as many places to the right hand as there are ciphers in the multiplier annexing ciphers if necessary.

2 When the product would contain many decimal places the work may be considerably shortened and only as many decimals retained as may be thought necessary, by setting the unit's place of the multiplier under that decimal place of the multiple and which is to be the last in the product, and disposing of the other figures in an inverted order.

Rectifying all the figures of the multiple and to the right of the multiplying figure, and adding to the first figure of every line what would arise from the product of the figures omitted, by carrying 1 from 5 to 14, 2 from 15 to 24, 3 from 25 to 34, &c and setting down the products with the right hand figure of each directly below each other—then the sum will be the required product, generally true to the nearest unit in the last figure.

Ex Multiply 27 14986 by 92 41035, and retain only four places of decimals in the product

27 14986 53014 29 24434874 542997 108599 2715 81 14	2508 9280
--	-----------

## DIVISION OF DECIMALS

**RULE** Divide as in whole numbers, and the quotient will contain as many places of decimals as those in the dividend exceed those in the divisor therefore, when there are not so many the deficiency must be supplied by ciphers on the left. Also, when the dividend does not contain the divisor, or there is a remainder, ciphers may be annexed to the right of it, and the division continued at pleasure.

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Ex. Divide 192 by 5423.

5423)192 0000 (35 404, &c quotient  
16269

29310  
27115

21950  
21692

25800  
21692

4108 remainder

**NOTES** 1 When the divisor is an integer with any number of ciphers on the right of it, they may be omitted, and the point in the dividend removed an equal number of places to the left, and then the division performed as before. Consequently when the divisor is 1 with ciphers, the division is unnecessary.

2 When the quotient is required to contain only a certain number of decimals, take as many figures from the left of the divisor as the quotient is to contain, and divide as before, observing to carry for the figures omitted as in the second note to multiplication. But instead of annexing 1 dividend figure to the remainder for every figure of the quotient, omit one more in the divisor. When the number of figures in the divisor is less than the number required in the quotient, ciphers must be added to the former. The work will be much contracted if the subtractions be made mentally, and the remainders only set down, as below.

Ex. Divide 2508 92806 by 92 41035, and retain only decimals in the quotient, which will then consist of six places

92 41035)2508 92806(27 1498

660721

13849

4608

912

80

6

3 A vulgar fraction is reduced to an equivalent decimal by annexing ciphers to the numerator and dividing by the denominator, and the number of decimals in the quotient will be equal to that of the ciphers used. Thus  $\frac{1}{2} = 75$ ,  $\frac{2}{3} = 875$ ,  $\frac{3}{4} = 42857142$ , &c and  $\frac{1}{5} = 11111$ , &c. In many cases, as in the last two there is no limit to the division, and such quotients are called circulating decimals, for the treatment of which, see CIRCULATES.

4 The value of a decimal in terms of the inferior denominations, is found and integers or decimals reduced to equivalent decimals of higher denominations, by the rule for reduction of integers. Also proportion in decimals is performed, after proper reduction of the terms as in whole numbers.

## DUODECIMALS

Are vulgar fractions, the denominators of which increase from unity in a twelve fold proportion, the division and sub-division of the integer being into 12th's instead of 10th's, as in the decimal scale.

This method of division seems to have been adopted for the purpose of finding the contents of artificer's work, the dimensions of which are usually taken in feet, inches, and quarters, parts smaller than these being rejected.

**RULE.** Set down the two dimensions, feet under feet, and inches under inches—Begin the multiplication with the feet in the multiplier, and the inches in the multiplicand, carrying 1 for every 12 from each lower denomination to the next higher, and set the remainders directly under the corresponding terms of the multiplicand. Then multiply by the inches in a similar manner, and set the result one place to the right of the former product, or annex the lowest denomination as a fraction to the next higher. And the sum of their products, 1 being carried for every 12 in adding, will be the whole product required.

Ex 1 Multiply 4f 7in 2 Multiply 14f 9in  
by 6 4 by 4 6

27 6  
1 64

59 0  
7 42

Ans 29 01

Ans 66 42

**NOTES** 1 The numbers in the second columns of the above examples, generally called inches, are neither lineal nor square inches, but 12 h parts of a foot, or small rectangles, 1 inch broad and 12 long. Therefore, to obtain square inches, multiply them by 12. Thus, the answer to the last example is 66 feet, 54 square inches.

2 The answers however, in many examples, is easier obtained by the usual method of vulgar or decimal fractions. Thus, in the last example,

$$14f \ 9in = 14\frac{3}{4} = \frac{3}{4}$$

$$\text{and } 4 \ 6 = 4\frac{1}{2} = \frac{1}{2}$$

$$\text{then } \frac{3}{4} \times \frac{1}{2} = \frac{3}{8} = 66\frac{3}{8} = 66 \ 4\frac{1}{2} \text{ answer}$$

$$\text{Or, } 14, 9 = 1475 \text{ and } 4, 6 = 45$$

$$\text{then } 1475 \times 45 = 66375 = 66, 4\frac{1}{2} \text{ as above}$$

## INVOLUTION

Is the raising of powers from any given number, is a root. A power is the product obtained by multiplying the root a certain number of times by itself. And the number denoting how often the root is to be increased by itself is called the index, and placed above the number. Or, a power may be defined, the last of that number of continued geometrical proportionals to unity, which is expressed by the index, the first of them being the number itself when the power is integral—when it is fractional, the number of continued proportionals is denoted by the numerator of its index, and the first of them is that root of the number which is expressed by its denominator.

Ex. Required the 4th power of 7

$$7^4 = 7 \times 7 \times 7 \times 7 = 2401, \text{ the answer}$$

## EVOLUTION

Or the extraction of roots, is the operation by which such a number or root is found, as being multiplied a certain number of times by itself, will produce that power, and it is denominated the square, cube, 4th, 5th, root, &c according as it is, when raised to the 2d, 3d, 4th, 5th, &c power, equal to that power. Thus, 2 is the square root of 4, because  $2 \times 2 = 4$ , and 4 is the cube root of 64, because  $4 \times 4 \times 4 = 64$ , and so on.

A root may also be defined by the second definition of a power, above, by only substituting first for last, and the contrary.

Although there is no number of which we cannot find any power exactly, yet there are many numbers of which a precise root can never be determined. But, by the help of decimals, we can approximate towards the root, to any assigned degree of exactness.

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Those roots which are found by approximation only are called surd roots, and those which are perfectly accurate are termed rational roots.

Roots are generally denoted, as in algebra, by writing the character  $\sqrt{\quad}$  before the power, with the index of the root against it: thus, the third root of 70 is expressed  $\sqrt[3]{70}$ , and the second root of it is  $\sqrt{70}$  the index 2 being always omitted when the square or second root is designed.

If the power be expressed by several numbers, with the sign + or - between them, a line is drawn from the top of the sign over all the parts of it, thus, the third root of  $28-13$  is  $\sqrt[3]{28-13}$ .

Roots are sometimes designed like powers, with fractional indices, thus, the square root of 5 is  $5^{\frac{1}{2}}$ , the third root of 19 is  $19^{\frac{1}{3}}$ , and the fourth root of  $40-12$  is  $40-12^{\frac{1}{4}}$ , or  $(40-12)^{\frac{1}{4}}$ .

**EXTRACTION OF THE SQUARE ROOT**  
Consists in finding a number, which being multiplied once by itself will produce the power.

**RULE** Divide the given number into periods of two figures each, beginning at the unit's place and proceeding to the left hand in integers, and to the right in decimals.—Find the greatest square in the first period on the left hand, and set its root on the right hand of the given number, after the manner of a quotient figure in division.—Subtract the square thus found from the said period, and to the remainder annex the two figures of the next period for a dividend.—Double the root above mentioned for a divisor, and find how often it is contained in the said dividend, exclusive of its right hand figure, and set that quotient figure both in the quotient and divisor.—Multiply the whole augmented divisor by this first quotient figure and subtract the product from the said dividend, bringing down the next period of the given number as before, for a new dividend.—Repeat the same process for each period, and the number thus obtained will be the root required.

**NOTES** 1 The best way of doubling the root, to form the new divisors, is by adding the last figure to the last divisor.

2 The root will necessarily consist of as many integers and decimals as there are periods in each respectively. And when the figures of the given number are all exhausted, the operation may be continued at pleasure by adding ciphers, two in each period.

Required the square root of 5499025  
5499025(2345 the root

$$\begin{array}{r} 464)2090 \\ \underline{1856} \\ 4685)23425 \\ \underline{23425} \end{array}$$

3 When the root is to be extracted to many places of figures, the work may be considerably shortened, by extracting according to the common method until one more than half the required number of figures in the root be obtained, and then dividing the last remainder by its correspond-

ing divisor, after the manner of the second note in division of decimals.

**Ex** Required the square root of 2, to nine places of figures

2 (1 4142

$$\begin{array}{r} 24 \mid 100 \\ 4 \mid 96 \end{array}$$

$$\begin{array}{r} 281 \mid 400 \\ 1 \mid 281 \end{array}$$

$$\begin{array}{r} 2824 \mid 11900 \\ 4 \mid 11296 \end{array}$$

$$\begin{array}{r} 28282 \mid 60400 \\ 2 \mid 56564 \end{array}$$

$$\begin{array}{r} 28284 \mid 3836 \quad 1356 \\ \phantom{28284 \mid} 1008 \\ \phantom{28284 \mid} 160 \\ \phantom{28284 \mid} 19 \\ \phantom{28284 \mid} 2 \end{array}$$

Ans 1 41421356 the root required

As this method is generally given without any demonstration, and the reason for dividing is above may not appear evident to many, we shall give the following.

Let the proposed number be denoted by N the root of the greatest square contained in it by r, and the difference between r and the true root by d

$$\text{Then } N = r^2 + 2rd + d^2$$

$$\text{Or } N - r^2 = 2rd + d^2,$$

And, by dividing both sides of the equation by 2r,

$$\frac{N - r^2}{2r} = d + \frac{d^2}{2r}$$

Now as the number of figures in any square cannot exceed double those in its root, and the number in d is less than half that in r, it follows, that the value of  $\frac{d^2}{2r}$  will always be fractional, and,

therefore, less than unity of the right hand figure of d. Hence it may be rejected, and the equation becomes  $\frac{N - r^2}{2r} = d$ , the rule above.

4 The roots of vulgar fractions may be obtained, after reducing them to their lowest terms, either by extracting the root of the numerator and denominator respectively, which is the best way when they are complete powers, or by multiplying the numerator and denominator together, and making the root of the product the numerator to the denominator, or the denominator to the numerator of the given fraction. The reason for this operation will appear in the second example.

Mixed numbers may either be reduced to improper fractions, or the fractional parts to decimals, and then the root extracted as above.

Also, by means of the square root, any root the index of which is some power of 2 may readily be found. As the fourth root by two, and the eighth root by three extractions, &c.

**Ex** 1 What is the square root of  $\frac{25}{16}$ ?

$$\sqrt[4]{\frac{25}{16}} = \sqrt{\frac{5}{4}} \text{ and } \sqrt{\frac{5}{4}} = \frac{\sqrt{5}}{2}, \text{ answer}$$

2 Required the square root of  $\frac{15}{12}$

$$\begin{aligned} \sqrt{\frac{5}{12}} &= \sqrt{\frac{5 \times 12}{12 \times 12}} = \sqrt{\frac{60}{144}} = \frac{\sqrt{60}}{12} \\ \frac{77459607}{12} &= 6454972 \text{ the required root.} \end{aligned}$$

Or  $\sqrt{\frac{5}{12}} = \sqrt{\frac{5+5}{12+5}} \approx \sqrt{\frac{60}{17}}$   
 $= 6454972$ , the same as before

Is the method of finding a number, the cube of which shall be equal to the given number from which it is obtained. As the common rule for this operation is so tedious and difficult to be remembered, we shall only give the following approximating method, which is, perhaps, the simplest, and the best adapted for general use of the kind. This rule was probably derived from Dr Halley's rational formula, as it only differs from it by being rather more com模othously expressed, and was, we believe, first used by Mr James Dodson

**RULE** Find by trials the nearest rational cube to the given number, and call it the assumed cube. Then, as double the assumed cube added to the given number, is to double the given number added to the assumed cube, so is the root of the assumed cube to the required root, nearly. Or, as the first sum is to the difference of the given number and assumed cube, so is the assumed root, to the difference of the roots, nearly.—By taking the cube of the root thus found, for the assumed cube, and repeating the operation, the root will be had to a still greater degree of exactness.

Ex Required the cube root of 210358 By a few trials the root is found to be between 27 and 28 Taking, therefore, 27, its cube is 19683, which is the assumed cube Then,

19683 21035 8  
2 2

39366 42071 6  
21035 8 19683

As 60401 8

the root nearly

Again, for a second operation, the cube of this root is 2103, 318645155823, and the process by the latter method will be

21035 318645 &c

4-070 637290 21035 8  
21035 8 21035 318645 &c

$$\begin{array}{r} \text{As } 63106\ 43729 \quad \text{diff } 481355 \quad 27\ 6047 \\ \quad \quad \quad \text{the dif} \quad \quad \quad \underline{000210834} \\ \text{conseq the root req is } 27\ 604910834 \end{array}$$

The following general approximating rule was first given by Dr. Hutton, and investigated in his Tracts, vol. 1. page 45, &c

**RULE.** Let  $N$  be the given power or number,  $n$  the index of the power,  $A$  the assumed power,  $r$  its root,  $R$  the required root of  $N$

Then, as the sum of  $n + 1$  times  $A$  and  $n - 1$  times  $N$ , is to the sum of  $n + 1$  times  $N$  and  $n - 1$  times  $A$ , so is the assumed root  $r$ , to the required root  $R$ .

Or, as half the said sum of  $n+1$  times  $A$  and  $n-1$  times  $N$ , is to the difference between the given and assumed powers, so is the assumed root  $r$ , to the difference between the true and assumed roots which difference, added or subtracted, as the case requires, gives the true root nearly

That is,  $n+1$   $A+n-1$   $N$   $n+1$   $N+n-1$   $A$   
 $\pm R$ . Or,  $n+1$   $\frac{1}{2}A+n-1$   $\frac{1}{2}N$   $A$   $\oslash$   $N$   $\mp$   
 $R$   $\oslash$   $\mp$  While  $\oslash$  denotes the general difference  
 and the operation may be repeated as often as  
 we please, by using always the last found root for

the assumed root, and its  $n$ th power for the assumed power  $A$

**Ex** To extract the 5th root of 21035 8

Here it appears that the 5th root is between 7.3 and 7.4. Taking 7.3, its 5th power is 20730.71593. Hence then we have

$$N = 20358, i = 7, n = 5, \frac{1}{2}n + 1 = 3, \frac{1}{2}n - 1 = 2$$

$$A = -0730716$$

N-A = 305 084

$$A = 20730 \underset{3}{716} \quad N = 21035 \underset{2}{8}$$

$$\begin{array}{r} 3A = 62192148 \\ -N = 420716 \end{array}$$

As 104-637 305 084 73 0-13605  
73

915252  
21,5588

10426, 7) 2227 1132( 0213605 t. diff  
14184 7 3 = 1 idd

$3750$   
 $650$   
 $5$

$731,60 = R$  the root  
 true to the last fig

As another good approximating rule, we shall add that discovered by Haros, and which is

Find the nearest power to the given number, and multiply the difference between it and the given number by double its root for a dividend — And for a divisor, multiply the nearest power by double the index of its root, and add to or take from the product, as the power is too little or too great, the above difference multiplied by one less than the index. Then the root of the nearest power increased or diminished, as the case may require, by the quotient obtained by the division, will be the true root nearly.

N B Two operations are generally necessary in order to have the answer true to 6 or 7 figures and the result of the first must always be used as the root in the second

The algebraic expression of the rule is

$$2 \text{ and } m=3, \text{ become}$$

$$\sqrt{a^3 \pm b} = a \pm \frac{2ab}{4a^2 \pm b}, \text{ and}$$

$$\sqrt[3]{a^3 \pm b} = a \pm \sqrt[3]{b}$$

Ex 1 Required the 6th root of 2

Here the nearest power being 1, and the difference between it and the given number 1 also, we have, for the first approximation,

$$1 + \frac{2+1+1}{2+6+1+(6-1)1} = 1.12 \text{ nearly}$$
 Then  $2 - 1.12 = 2 - 1.978127 = 0.021773$  the second difference, therefore,
 
$$\frac{1.12 + 0.021773}{(2+6+1.978127) + (6-1) + 0.021773}$$

$$= 1.12 + \frac{0.0867152}{23.876189} = 1.12 + 0.00462 = 1.12462$$

**Answer**

2 What is the cube root of 12?

The nearest cube is 8, the root of which is 2, and  $12-8=4$ , the difference, hence

$$2 + \frac{2+4}{(3+8)+4} = 2 + \frac{6}{11} = 2 + \frac{6}{11} = 2.545 \text{ nearly}$$

Then,  $12 - 2 \cdot 28^3 = 12 - 11852352 = 147648$ .

# ARITHMETIC.

hence,  $2 \text{ } 28 + \frac{2 \text{ } 28 + 147648}{(3 + 11 \text{ } 852352) + 147648} = 2 \text{ } 28 + \frac{166374}{35 \text{ } 764704} = 2 \text{ } 28 + 0094285 = 2 \text{ } 2894285$ , the ans  
nearly

## FELLOWSHIP

Is a particular branch of direct proportion, and is chiefly used for dividing any sum or quantity into any assigned number of parts, in a given proportion to each other. It is usually distinguished into single and double Fellowship, the former when the parts are each proportional to one number only, and the latter when they are proportional to more than one number.

### SIMPLE FELLOWSHIP

**RULE** As the sum of the numbers which denote the proportion of the shares is to the sum or quantity to be divided, so is each proportional number to its corresponding part.

**PROOF** The sum of the several parts will be equal to the number divided, which the work is right.

**Ex** Three persons A, B, C, freighted a ship with 340 tun of wine of which, A loaded 110 tun, B 97 and C the rest. In a storm the seamen were obliged to throw overboard 85 tuns, how much must each per on sustain of the loss.

**Hic** 110 + 97 = 207 tuns, loaded by A and B  
therefore, 340 - 207 = 133 tuns loaded by C.

**Then** as 340 85 110

or as 4 1 110  $27\frac{1}{2}$  tuns - A's loss,  
and as 4 1 97  $24\frac{1}{2}$  tuns - B's loss,  
also as 4 1 133  $33\frac{1}{2}$  tuns - C's loss

Sum 85 tun, the proof

### DOUBLE FELLOWSHIP

Is principally concerned in the adjustment of effects when both the cause and the time of its operation are to be considered, as when the stocks of partners are the same but employed for different times, or different and employed for the same time, or when both stock and time are different.

**RULE** Multiply each cause by the time of its operation, and say, as the sum of these products is to the whole effect, so is each particular product, to its proportional part of the effect.

**PROOF** As in single Fellowship.

**Ex** H with a capital of 1000*l*, began trade the first of January, and meeting with success in business took in I as a partner, with a capital of 1500*l*, on the first of March following. Three months after that they admit K as a third partner, who brought into stock 2800*l*. After trading together till the end of the year they find there has been gained 1776*l* 10*s*. how must this be divided among the partners?

**First**  $\begin{cases} 1000 + 12 = 12000 & \text{H's stock and time} \\ 1500 + 10 = 15000 & \text{I's ditto} \\ 2800 + 7 = 19600 & \text{K's ditto} \end{cases}$

46600 sum

Then,  $\begin{matrix} \text{£} & \text{s} & \text{d} \\ 28 \text{ } 466 & 1776 & 10 \end{matrix} \begin{cases} 100 & 457 & 9 & 4\frac{1}{2} & \text{H's pt} \\ 150 & 571 & 16 & 8\frac{1}{2} & \text{I's do} \\ 196 & 747 & 3 & 11\frac{1}{2} & \text{K's do} \end{cases}$

Proof  $\text{£} \text{ } 1776 \text{ } 10 \text{ } 0$

## INTEREST

Of money is the premium paid for the use of a sum, and is by law in this country limited to five per cent per ann.

The interest of 100*l* for a year is called the rate per cent. The sum lent, the principal, and the principal and interest added together, the amount.

Interest is of two kinds, simple and compound.

### SIMPLE INTEREST

Is the premium paid for the use of the first principal only for the whole time, and is, therefore, directly proportional to this principal and the time of its continuance. Hence this.

**RULE** Multiply the principal by the rate and time successively, and divide by 100, or cut off two figures from the right hand of the pounds which with the lower denominations, reduced to shillings and pence, will be the answer.

**Ex** What is the interest of 945*l* 10*s* for 9 years, at 5 per cent per ann.

$\begin{matrix} \text{£} & \text{s} \\ 945 & 10 \times 5 \times 9 \\ \hline 425 & 47 \end{matrix} \quad 10 = 42 \text{ } l \text{ } 9 \text{ } s \text{ } 6 \text{ } d \text{ } ans$

**NOTE 1** When there are certain parts of year in the time a quarter or months or days, they may be worked for either by taking the aliquot or like parts of the interest of a year, or by the rule of three in the usual way.

**Ex** What is the interest of 200 pounds for 4 years 7 months and 25 days at  $4\frac{1}{2}$  per cent per ann?

$\begin{matrix} \text{ds} & \text{l} & \text{d} \\ 210 & \text{As } 365 & 94, & 25 & \text{l} \\ 4\frac{1}{2} & \text{or } 73 & 945 & 5 & 6472 \\ \hline & & & 5 & \\ 840 & & & & \\ 105 & & & & \\ \hline & 73) & 475 & ( & 6472 \\ & & 345 & & \\ \hline & & 945 & \text{interest for } 1 \text{ yr} & 50 \\ & & 4 & & 19 \end{matrix}$

$6 \text{ mo} - \frac{1}{2} \text{ } 4 \text{ } 72, \quad \text{ditto } 4 \text{ years}$   
 $1 \text{ mo} - \frac{1}{12} \text{ } 7875 \quad \text{ditto } 6 \text{ months}$   
 $6472 \quad \text{ditto } 1 \text{ month}$   
 $\quad \text{ditto } 25 \text{ days}$

$\begin{matrix} 43 & 957 \\ \hline 20 \\ \hline 5 & 1940 \\ \hline 12 \\ \hline 2 & 3280 \\ \hline 4 \\ \hline 9 & 3120 \end{matrix}$

Ans 43*l* 19*s* 2*d*

2 The rules for simple interest serve also for the calculation of insurance, the purchasing of stocks, or any thing that is rated at so much per cent.

### COMPOUND INTEREST,

Or interest upon interest is, as the latter designation expresses, when the interest, instead of being paid, is added to the principal, and becomes part of an increased capital. This is not allowed by law, though it can be practised without infringing any statute by renewing the bond or instrument and composing the whole in it, or by lending the interest separately. It is, however, customary to allow compound interest in purchases, annuities, pensions or leases in reversion &c.

**RULE 1** Find the amount of the given principal, for the time of the first payment, by simple

# ARITHMETIC.

Interest, and consider it as a new principal for the second payment, amount of which calculate as before. And so on, through all the payments to the last, always using the last amount as a new principal for the next payment.

2 Find the amount of 1 pound for the time of the first payment, and involve it to the power whose index is denoted by the number of payments. Then that power multiplied by the given principal, will produce the whole amount. From which the principal being subtracted, leaves the compound interest.

NOTE When the rate per cent. is an aliquot part of 100, take the same part of the principal for the interest, as in the first method below.

Ex Required the amount of 720l for 4 years, at 5 per cent per annum.

Here 5 is the 20th of 100, and the interest of 1l for a year is  $\frac{1}{20}$  or 05, and its amount 1 05. Therefore,

By the 1st Rule

£	s	d	
20)720	0	0	1st year's principal
36	0	0	1st year's interest

20)756	16	
37	0	2d year's principal
		2d year's interest

20)793	16	0	
39	13	9	3d year's principal
			3d year's interest

20)833	9	9	
41	13	5	4th year's principal
			4th year's interest

£ 875 3  $3\frac{1}{2}$  the whole amount  
or answer required

By the 2d Rule

1 05 amount of 1l  
1 05

1 1025 2d power of it  
1 1025 di to

1 21550625 4th power of it  
720

875 1645  
20

3 2900  
12

d 3 4800

POSITION

Is a method of resolving certain questions, which do not fall under the direct rules, and consists in attaining the true answer from the assumption of false numbers. It is of two kinds, single and double.

SINGLE POSITION

Has place when the results are proportional to their suppositions, and therefore only one supposition is necessary.

RULE Assume any number for that required, and perform the operations described in the question with it. Then say, as the result obtained, is to the number assumed, so is the result in the question, to the answer.

Ex. A person, after spending  $\frac{1}{4}$  and  $\frac{1}{5}$  of his money, has yet remaining 60l, what had he at first?

Suppose he had at first 120l	Proof
Now $\frac{1}{4}$ of 120 is 40	$\frac{1}{4}$ of 144 is 48
$\frac{1}{5}$ of it is 30	$\frac{1}{5}$ of 144 is 36

their sum is 70  
which taken from 120

leaves 50

their sum 84  
taken from 144

leaves 60 as

per question.

Then, 50 120 60 144, the answer

DOUBLE POSITION

Is a method of answering questions similar to those in single position but which have not their results proportional to their positions. It is performed by means of two suppositions of false numbers.

RULE Assume two numbers and find two results from them, as in single position. Then take the difference between each result and that mentioned in the question, calling them the errors, and observing whether they are too great or too little. Multiply each error by the contrary supposition, and divide the difference of the products by the difference of the errors when they are either both too great or too little, but divide the sum of the products by that of the errors when one of them is too great and the other too little, for the answer.

Or multiply the difference of the assumed numbers by the least error, and divide the product by the sum or difference of the errors as above.

Then the assumed number belonging to the error multiplied by, being increased or diminished by the quotient, as it was too little or too great, will be the number required.

Ex 1 What number is that which being multiplied by 6, the product increased by 18, and the sum divided by 9 the quotient shall be 20.

By the first method

Suppose the two numbers 18 and 30

First Position	Second Position	Proof
18 Suppose	30	27
6 mult	6	6

108	180	162
18 add	18	18

9) 126	9) 198	9) 180
--------	--------	--------

14 results	22	
20 true res	20	

+ 6 errors unlike  
2d pos 30 mult.

Er- { 2 180  
rors { 6 36

sum 8) 216 sum of products

27 answer sought.

2 What number is that which added to its square makes the sum 12?

By the second method

The errors, found as in the above example, are 18 and 3, both too great, the two suppositions being 5 and 4.

Then,  $4 - \frac{(5-4)+8}{18-3} = 4 - \frac{1}{3} = 3\frac{2}{3}$  answer

N B For the other rules usually included in more comprehensive treatises on arithmetic, and not found in this, see their respective titles.



## A R I

**ARITHMETICAL**, something relating to or after the manner of arithmetic

**ARITHMETICAL COMPLEMENT**, of a logarithm, is what the logarithm wants of 10 00000 &c, and the easiest way to find it is, beginning at the left hand, to subtract every figure from 9, and the last from 10. So, the arithmetical complement of 8 2501396 is 1 7498004 — It is commonly used in trigonometrical calculations, when the first term of a proportion is not radius, in that case, adding all together, the logarithms of the 3d, 2d, and arithmetical complement of the 1st term

**ARITHMETICAL MEAN, or MEDIUM**, is the middle term of three quantities in arithmetical progression, and is always equal to half the sum of the extremes

**ARITHMETICAL PROGRESSION**, is a series of three or more quantities that have all the same common difference as 3, 5, 7, &c which have the common difference 2, and  $a, a + d, a + 2d$ , &c which have all the same difference  $d$

In an arithmetical progression, the chief properties are these 1st, The sum of any two terms, is equal to the sum of every other two that are taken at equal distances from the two former, and equal to double the middle term when there is one equally distant between those two — so, in the series 0, 1, 2, 3, 4, 5, 6, &c  $0 + 6 = 1 + 5 = 2 + 4 =$  twice 3 or 6 — 2d, The sum of all the terms of any arithmetical progression, is equal to the sum of as many terms of which each is the arithmetical mean between the extremes, or equal to half the sum of the extremes multiplied by the number of terms — so, the sum of these ten terms 0, 1,

2, 3, 4, 5, 6, 7, 8, 9, is  $\frac{0+9}{2} \times 10$ , or  $9 \times 5$ ,

which is 45 — and the reason of this will appear by inverting the terms, adding them under the former terms, and adding each two together, which will make double the same series,

thus    0, 1, 2, 3, 4, 5, 6, 7, 8, 9,  
inverted 9, 8, 7, 6, 5, 4, 3, 2, 1, 0,  
sums 9, 9, 9, 9, 9, 9, 9, 9, 9

where the double series being the same number of 9s, or sum of the extremes, the single series must be the half of that sum — 3d, The last, or any term, of such a series, is equal to the first term, with the product added of the common difference multiplied by 1 less than the number of terms, when the series ascends or increases, or the same product subtracted when the series descends or decreases — so, of the series 1, 2, 3, 4, &c whose common difference is 1, the 50th term is  $1 + (1 \times 49)$ , or  $1 + 49$ , that is 50, and of the series 50, 49, 48, &c the 50th term is  $50 - 1 \times 49$ , or  $50 - 49$ , which is 1. Also, if  $a$  denote the least term,

$z$  the greatest term,  
 $d$  the common difference,  
 $n$  the number of the terms,  
and  $s$  the sum of them all,

## A R I

then the principal properties are expressed by these equations, viz,

$$\begin{aligned} z &= a + d \frac{n-1}{1}, \\ a &= z - d \frac{n-1}{1}, \\ s &= a + z \frac{1}{2} n \\ s &= z - \frac{1}{2} d \frac{n-1}{1} n, \\ s &= a + \frac{1}{2} d \frac{n-1}{1} n \end{aligned}$$

Moreover, when the first term  $a$ , is 0 or nothing, the theorems become  $z = d \frac{n-1}{1}$

and  $s = \frac{1}{2} z n$

See Hutton's and Keith's Arithmetic

**ARITHMETICAL PROPORTION**, is when the difference between two terms, is equal to the difference between other two terms. So, the four terms, 2, 4, 10, 12, are in arithmetical proportion, because the difference between 2 and 4, which is 2, is equal to the difference between 10 and 12

**ARITHMETICAL RATIO**, is the same as the difference of two succeeding terms, in an arithmetical series

**ARITHMETICAL SCALFS**, a name given by M. de Buffon, in the Mem Acad for 1741, to different progressions of numbers, according to which arithmetical computations might be made. It may pretty safely be asserted that the common decuple scale is a good convenient medium, the numbers expressed being tolerably short and compendious, and no single character representing too large a number. Still, however, it must be observed that the duodecimal scale has many advantages, and some are of opinion that it is the best of all scales which have been yet proposed. See Hutton's Ozanam, vol I p 5, &c and SCALE

**ARITHMETICALLY** *ad* (from *arithmetical*) In an arithmetical manner

**ARITHMETICIAN** *s* (from *arithmetick*) A master of the art of numbers (*Addis*)

**ARITUM**, in ancient geography, a town of Spain, in Lusitania, situated upon the Tagus, north-east of Alisipo

**ARIUS**, founder of the sect called Arians, was born in Libya, early in the 4th century. He became popular at Alexandria, and was orthodox till his ambitious views were crossed with respect to church preferment, when he broached his opinion against the divinity of the Word — this occasioned such disputes, that the emperor called a council at Nice, in 325, to put an end to them. In this council the opinion of Arius was condemned, and the celebrated confession of faith known by the name of the Nicene Creed was drawn up. Arius was then banished, but was recalled two years after. Several disputes took place between Arius and Athanasius — he at length, however, triumphed over his powerful antagonist, and was readmitted into the church. He was then conducted in triumph by his followers to the great church, but on the way, being pressed by a natural necessity, he retired to a house of convenience, where he died, in 336

## A R K

ARK, in the scripture language, a kind of vessel, made by the command of God himself, for preserving Noah and his family, together with the several species of animals, from the universal deluge. The ancients inform us, that the Egyptians used barks made of bulrushes on the Nile, and that these barks were of an oblong square figure, and so light as to be carried by a single man. There is great reason to think that Noah's ark was made in the form of these Egyptian boats, but of an infinitely larger size.

There are several difficulties proposed with relation to Noah's ark. One question is, how long time Noah was employed in building it? Interpreters generally believe, that he was an hundred and twenty years, but some allow him only 52 years, some no more than seven or eight, and others still much less. The Mishmedans say he had but two years allowed him for this work. Another question is, what kind of wood is meant by gopher wood? Some think cedar, or box, others cypress, the pine, fir tree, and the turpentine tree. Pelleret takes the opinion of those who hold the ark made of cedar: his reasons are, the incorruptibility of that wood, the great plenty thereof in Asia, whence Herodotus and Theophrastus relate that the kings of Egypt and Syria built whole fleets of it in lieu of ships, and the common tradition throughout the East imports that the ark is preserved entire to this day on mount Ararat.

The dimensions of the ark, as delivered by Moses, are three hundred cubits in length, fifty in breadth, and thirty in height, which, compared with the great number of things it was to contain, seem to many to have been too scanty. And hence an argument has been drawn against the authority of the relation. Celsus long ago laughed at it, calling it *αἰνωτόν*, the absurd ark. This difficulty is solved by Buteo and Kircher, who, supposing the common cubit of a foot and a half, prove geometrically, that the ark was abundantly sufficient for all the animals supposed to be lodged therein. The capacity of the ark will be doubled, if we admit, with Cumberland, &c. that the Jewish cubit was 21.888 inches. Snellius computes the ark to have been above half an acre in area. Caneus, and others, have also calculated the capacity of the ark. Dr. Arbuthnot computes it to have been 81002 turns. — Father Lamy says, that it was an hundred and ten feet longer than the church of St. Mary at Paris, and sixty-four feet narrower, so which his English translator adds, that it must have been longer than St. Paul's church in London, from west to east, broader than that church is high in the inside, and about fifty-four feet in height of our measure.

The things contained in the ark were, besides eight persons of Noah's family, one pair of every species of unclean animals, and seven pairs of every species of clean animals, with provisions for them all, during the whole year. The former appears, at first view, almost in-

finite. But if we come to a calculation, the number of species of animals will be found much smaller than is generally imagined, out of which, in this case, are to be excepted such animals as can live in the water, and bishop Wilkins imagines, that only seventy-two of the quadruped kind needed a place in the ark.

It appears to have been divided into three stories, and it is agreed on, as most probable, that the lowest story was destined for the beasts, the middle for the food, and the upper for the birds, with Noah and his family, each story being subdivided into different apartments, stalls, &c. Though Josephus, Philo, and other commentators, add a kind of fourth story, under all the rest, being, as it were, the hold of the vessel, to contain the ballast and receive the filth and feces of so many animals.

Drexelius makes three hundred apartments, father Bouhier, three hundred and thirty three, the anonymous author of the Questions on Genesis, four hundred, Buteo, Timpourrus, Arnis Montanus, Wilkins, Lamy, and others, suppose as many partitions as there were different sorts of animals — Pelleret only makes seventy-two, viz. thirty six for the birds, and as many for the beasts: his reason is, that if we suppose a greater number, as three hundred and thirty three, or four hundred, each of the eight persons in the ark must have had thirty-seven, forty-one, or fifty stalls to attend and cleanse daily, which he thinks impossible. But there is not much in this, to diminish the number of stalls, without a diminution of the animals, is vain, it being, perhaps, more difficult to take care of three hundred animals in seventy-two stalls, than in three hundred.

Buteo computes, that all the animals contained in the ark could not be equal to five hundred horses, he even reduces the whole to the dimensions of fifty-six pair of oxen. Father Lamy enlarges it to sixty-four pair, or an hundred and twenty-eight oxen, so that supposing one ox equal to two horses, if the ark had room for two hundred and fifty-six horses, there must have been room for all the animals. And the same author demonstrates, that one floor of it would suffice for five hundred horses, allowing nine square feet to each horse.

As to the food in the second story, it is observed by Buteo from Columella, that thirty or forty pounds of hay ordinarily suffices an ox for a day, and that a solid cubit of hay, is usually pressed down in our hay-ricks, weighs about forty pounds, so that a square cubit of hay is more than enough for one ox one day. — Now it appears that the second story contained 150,000 solid cubits, which, divided between two hundred and six oxen, will afford each more hay by two thirds than he can eat in a year.

Bishop Wilkins computes all the carnivorous animals equivalent, as to the bulk of their bodies, and their food, to twenty-seven wolves and all the rest to two hundred and eighty beeves. For the former he allows the sustenance of 1825 sheep, and for the latter 109,500

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\*abbits of hay all which will be easily contained in the two first stories, and much room to spare —As to the third story, nobody doubts of its being sufficient for the fowls, with Noah, his sons and daughters

Upon the whole, the learned bishop remarks, that of the two, it appears much more difficult to assign a number and bulk of necessary things to answer the capacity of the ark, than to find sufficient room for the several species of animals already known to have been there —And his attributes to the impfection of our hosts of animals, especially those of the unknown parts of the earth, adding that the most expert mathematician, at this day, could not assign the proportions of a vessel better recommended to the purpose, than the ark —and hence finally concludes, that the quantity of the ark, which had been a subject of objection against scripture, ought to be a confirmation of its divine authority in those ridges, men, being the arts and philosophy were not obliged to prejudice them now, so that it been a human invention, it would have contrived according to those wild apprehensions which arise from confused and general ideas of things, as much too big, as it has been represented too little

**ARK OF THE COVENANT**, in scripture, denotes a kind of chest, wherein, by God's command, Exod xxi 16 were kept the two tables of stone, whereon God had engraven the ten commandments, given to Moses on the mount, and held in high veneration among the Hebrews. It contained likewise the golden pot that had manna and Aaron's rod, and the tables of the covenant Heb ix 4. The ark was deposited in the holiest place of the tabernacle. It was taken by the Philistines, and detained 20, some say 40 years, at Kirjath-jearim, but the people being afflicted with emeralds on account of it, returned it with divers presents, and it was afterwards placed in the temple

**ARKEL**, a district of the united provinces, in the low countries, belonging particularly to that of Holland, comprehending the town and signories of Asperia, of Heuchelnam, and some villages and otherwise called the country of Gorkum

**ARKI**, a town of European Turkey, situated in Bithynia, at the mouth of the river Basna

**ARKITEs**, in ancient geography, the descendants of Canaan, who inhabited the town of Arka or Arca

**ARKLOW**, a seaport town of Wicklow, in Ireland. Lat 52 42 N, Lon 6 5 W

**ARKWRIGHT** (Sir Richard), an English manufacturer, was originally a barber at Wirksworth, in Derbyshire, which situation he quitted about 1767, and went about the country buying hair. At Warrington he got acquainted with one Kay, a clockmaker, and projected with him a machine for spinning cotton, in perfecting of which, they were assisted by Mr Atherton of Liverpool. Mr Arkwright afterwards went into partnership with Mr Smalley

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of Preston, but not succeeding there, they went to Nottingham, and erected a cotton mill, which was worked by horses. By this time Mr Arkwright had taken out a patent for his machine, which, however, was set aside in 1787, in the court of King's Bench. He afterwards erected works at Cromford, in Derbyshire, and acquired a fortune of near half a million sterling. He was knighted on presenting an address to his majesty, in 1786, as high sheriff of the county of Derby, and died at his seat, August 3 1792

**ARLANI**, a town of France, in the department of Puy de Dome, and chief place of a canton in the district of Ambert, three leagues south of Ambert

**ARLE**, a river of Denmark, which runs into the north sea, four miles south of Bredstede

**ARLEQUIN** See HARLEQUIN

**ARLES**, an ancient town of France, in the department of the Mouths of the Rhone. Lat N Lon 4 13 1

**ARM** (capm, eopm, Saxon) 1 The member which reach from the shoulder to the hand (*Hyden*) 2 The large bough of a tree (*Stidney*) 3 An inlet of water from the sea (*Norris*)

**ARM** is also used figuratively for power. The secular arm is the lay or temporal authority of a secular judge, to which recourse is had for the execution of the sentences passed by ecclesiastical judges. The church sheds no blood

And the judges of inquisition, after they have found the person guilty, surrender him to the secular arm. The council of Antioch, held in 341, decrees that recourse be had to the secular arm to repress those who refuse obedience to the church. For secular arm, they here use exterior power

**ARM**, in respect of the magnet. A loadstone is said to be armed, when it is capped, cased, or set in iron or steel, in order to make it take up the greater weight, and also to distinguish readily its poles. See MAGNETISM

**ARM**, in the manage. A horse is said to arm himself when he presses down his head, and bends his neck so as to rest the branches of the bridle on his brisnet, in order to resist the efforts of the bit, and guard his bars and his mouth. A horse is said to arm himself with the lips, when he covers his bars with them, and thereby deadens the pressure of the bit, this is common to thick lipped horses, and may be prevented by having a bit-mouth, made with a cannon or scabb-mouth, broader near the banquetts than at the place of its pressure, or rest on the bars. For arming against the bit, the remedy is to have a wooden ball made, and covered with velvet, or other soft matter to put on his chaul, which will so press him between the jaw-bones, as to prevent his bringing his head so near his chest

**ARM OF A HORSE** See FORE THIGH

**ARM'S END** A due distance. A phrase taken from boxing (*Stidney*)

**TO ARM v a** (*armo*, Lat) 1 To furnish with armour of defence, or weapons of offence (*Pope*) 2 To plate with any thing that may

add strength (*Shakspeare*) 3 To furnish to fit up (*Wotton*) 4 To provide against (*Sp*)

**ARM** *n n* To take arms, to be fitted with arms (*Shakspeare*)

**ARMA DART**, in ancient charters, to make a knight or to give arms: We find also, **Arma mutare**, to change arms, in token of friendship **Arma reversata**, inverted arms, &c

**ARMA** in geography, a small province of South America with a town and river of the same name The soil is so fertile, that it produces twice a year

**ARMADA**, a Spanish term signifying a fleet of men-of-war The armada which attempted to invade England in the time of queen Elizabeth, is famous in history, it was partly scattered by the wind, and partly subdued by the English fleet, July 30th, 1588 On which occasion a medal was struck with this motto, *Affavit Deus, et disipavit*

**ARMADILLA**, in Spanish America, denotes a squadron of six or eight men-of-war, each furnished with from twenty-four to fifty pieces of cannon Hence the king maintains, to prevent foreigners from trading with the Spaniards, and the Indians The vessels of this armadilla have been much talked of under the name of *quindí costas*

**ARMADILLO** in natural history See **DAPUS**

**ARMAGEDDON**, a place spoken of in the Revelations xvi 16 which literally signifies the mountain of Megiddon or Megiddo, a city situated in the great plain at the foot of mount Carmel where King Josiah received his mortal wound in the battle against Necho king of Egypt

**ARMAGH** a county of the province of Ulster, in the north of Ireland, having its principal town of the same name Armagh is the see of an archbishop who is primate of all Ireland Lat 54 27 N Lon 6 34 W

**ARMAGNAC** the province of Guienne in France now forming a part of the department of Gers

**ARMAMAR** a small town of Portugal, in the province of Beira, and district of Lamego, containing two parishes and about 1300 inhabitants

**ARMAMAXI**, in antiquity Scythian chariots variously adorned, carried in processions

**ARMAMENTI** *s* (*armamentum*, Lat) A force equipped for war

**ARMAMENTARY** *s* (*armamentarium*, Lat) An armoury, an arsenal

**ARMAIURA**, (*armatura*, harness) In anatomy, the annis or internal membrane that surrounds the fetus

**ARMATURE**, **ARMATURA**, in a general sense, is the same with what we otherwise call armour **Armatura** is more particularly used in the ancient military art, for a kind of exercise, performed with diverse weapons, as darts, spears, arrows and the like In this sense, **armatura** stands contradistinguished from **paratura**, the latter being the exercise of the heavy-armed, the former of the light armed

**ARMED** in heraldry, is used in respect of beasts and birds of prey, when their teeth,

horns, feet, beak, talons, or claws, are of a different colour from the rest—He bears a cock, or a falcon, armed, or, &c

**ARMED CHAIR** *s* An elbow chair

**ARMED SHIP**, a vessel occasionally taken into the service of the government in time of war, and employed to guard some particular coast, or attend on a fleet She is therefore armed and equipped in all respect like a ship of war, and commanded by an officer of the navy

**ARMENA**, in botany, a name given by Pliny to a kind of wild asparagus

**ARMENIA**, a large country of Asia, bounded on the W by the river Euphrates on the S by Durbekr, Curistan, and Adirbajan on the E by Shirvan, and on the N by Georgia This country was once governed by its own king, but the Turks and Persians at present possess it between them

**ARMENIANS**, in respect of religion, a division among the eastern Christians, thus called from Armenia, the country anciently inhabited by them

Some have supposed, that christianity was established in Armenia by the apostle St Bartholomew, but this is certain, that in the beginning of the fourth century, the Armenian Christians were in a very flourishing state

The Armenian church, in the sixteenth century was governed by three patriarchs, the chief of whom resided in a monastery at Echmiazin There were other bishops among them who assumed the title of patriarchs without prerogative annexed to it, though, by authority derived from the chief patriarch they were allowed to consecrate bishops, and every third year to make and distribute the holy chrism, or ointment, which is the privilege of the patriarchs alone

The Armenians, since the conquest of their country by Scha Abbas, king of Persia, have had no fixed place of habitation, but are dispersed in divers parts of Persia, Turkey, and Tartary, and even some parts of Europe, particularly Poland—Their chief employment is merchandize, in which they excel—The cardinal de Richelieu, we are told, had a design to make an establishment of them in France, for promoting the commerce of that country And the chancellor Seguier granted them a printing-house at Marseilles

The religion of the Armenians is the Christian of the Eutychian sect that is they own but one nature in Jesus Christ, and when they speak of the hypostatical union, that he is perfect God and perfect man without mixture They have a high esteem for a book they call the *Evangel*, which treats of the infancy of Jesus, and says that the Virgin Mary being pregnant, her sister Salome accused her of having prostituted herself, to which the Virgin answered, that she needed only to lay her hand on her belly, and she would know how he came to be with child—This Salome accordingly did, and fire came out of her belly, which consumed the half of her arm, upon which she acknowledged her fault and drew it back again which it was healed by putting it to the same place

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The Armenian clergy consist of patriarchs, archbishops, doctors, secular priests, and monks. The secular priests are not allowed to marry a second time, and therefore they take care to choose young healthy wives. They maintain themselves and families by following some occupation, inasmuch, that they have hardly time to perform their ecclesiastical functions; they lie in the churches on the vigils of those days they are obliged to officiate.

The Armenians have seven sacraments, baptis in confirmation, penance, the eucharist, extreme unction, orders, and matrimony. In baptism, the child is plunged three times into the water, and the same form of words that is used with us is repeated every time, the priest then puts a small cord made with silk and cotton on the neck of the infant, and anoints his forehead, chest, stomach, arms, hips, hands, and feet, making the sign of the cross on each part. When the child is baptized he is carried home by the godfather with the sound of drums and trumpets. The women do not go to church till fifty days after their delivery, and they observe many Jewish customs.

At the communion, to which infants of two or three months old are admitted, the priests give a piece of the consecrated host, soaked in the consecrated wine. The elements are covered with a great veil, and placed in a cupboard near the altar, on the side of the gospel. When the priest takes the chalice and paten, he is followed by his deacons and subdeacons, with flambereaux and plates of copper furnished with bells. In this manner, with a censer before him, he goes in procession round the sanctuary, he then sees them on the altar pronounces the words of consecration, and turns himself to the people, who fall down, kiss the earth and beat their breasts; then, after taking it himself, he distributes the host soaked in wine to the people.

The Armenians seem to place the chief part of their religion in fasting and abstinence, and in one, the clergy, the higher the degree, the lower they must live, inasmuch that it is said the archbishops live on nothing but pulse. They consecrate holy water but once a year, at which time every one fills a pot and carries it home, which brings in a considerable revenue to the church.

**ARMENIAN VERSION**, in biblical history, an ancient translation of the Scriptures, for which the church of Armenia, according to the unanimous testimony of the Armenian writers, is indebted to Mesrob, who is said to have finished it in the year 410. The learned are divided in opinion whether this version was taken from the Greek, or from the Syriac version. The curious reader may consult *Mus. Michielis*, vol. ii. p. 98, &c.

**ARMINTIA**, one of the synonymous names of *Bos Americanus* or *Gmelin*, an animal which Dr Shaw considers merely as a variety of *Bos Indus*.

**ARMINTAI** **ARMENTINE** *a* (*armen-tai*, or *armen-tinus* Lat.) Belonging to a kind of head of cattle.

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**ARMENTIERS**, a small handsome town of France, in the department of the North. It is about 6 miles NW of Lille.

**ARMFNO'E** *a* (*armentus*, Lat.) Abounding with cattle.

**ARMGAUNI** *a* (*from arm and gannt*) Slender as the arm (*Shakspeare*).

**ARMHOLE** *s* (*from arm and hole*) The cavity under the shoulder (*Bacon*).

**ARMIGER**, armour-bearer. In modern writers denote a title of dignity, rendered in English by *esquire*.

**ARMIGLIER** *a* (*from arm* *ier*, Lat.) Bearing arms.

**ARMILLA** (*from armus*, the arm, diprice) The sound helmet which confines the tendons of the carpus.

**ARMILARY**, in a general sense, something consisting of rings or circles. *From armilla* a bracelet.

**ARMILARY SPHERE**, an artificial sphere composed of a number of circles of the mundane sphere put together in their natural order, to ease and assist the imagination in conceiving the constitution of the heaven and the motion of the celestial body. The armillary sphere revolves upon its axis as thus a silvered balloon which is divided into degrees, and moveable every way upon its supports. The other parts are the equinoctial, zodiac, meridian, the two tropics, and the two polar circles.

**ARMILLARID** *a* (*armillatus*, Lat.) Having a bracelet.

**ARMILUSTRIUM**, a Roman feast, in which they sacrificed, armed, while trumpets sounded.

**ARMINGS** (*In a ship*) The same with, waste clothes.

**ARMINIANS**, a religious sect, or party, which arose in Holland by a separation from the Calvinists. They followed the doctrine of Arminius who thinking the doctrines of Calvin, with regard to free-will, predestination and grace, too severe began to express his doubts concerning them in the year 1601, and upon farther enquiry adopted sentiments more nearly resembling those of the Lutherans than of the Calvinists. The controversies on this subject became very general after the death of Arminius, in the year 1609 and threatened to involve the United Provinces in civil discord. The Arminian tenets gained ground under the mild and favourable treatment of the magistrates of Holland, though in the result of the contest, the Arminians were overpowered and oppressed, and reduced to a state of exile, till after the death of prince Maurice, in 1625. The Arminian system has very much prevailed in England since the time of archbishop Laud, and its votaries in other countries are very numerous.

The distinguishing tenets of the Arminians may be comprised in the following five articles, relating to predestination, universal redemption, the corruption of man, conversion, and perseverance. With respect to the first, they maintained, "That God, from all eternity, predesti-

mined to bestow salvation on those, who, he foresaw, would persevere unto the end in their faith in Christ Jesus, and to inflict everlasting punishments on those who should continue in their unbelief, and resist, unto the end, his divine succours: so that election was conditional, and reprobation in like manner the result of foreseen infidelity, and persevering wickedness."

On the second, the Arminians taught, "That Jesus Christ, by his sufferings, and death, made an atonement for the sins of all mankind in general, and of every individual in particular, that, however, none but those who believe in him can be partakers of this divine benefit."

On the third article they held, "That true faith cannot proceed from the exercise of our natural faculties and powers, nor from the force and operation of free will, since man in consequence of his natural corruption, is incapable either of thinking or doing any good thing, and that therefore it is necessary, in order to his conversion and salvation, that he be regenerated and renewed by the operation of the Holy Ghost, which is the gift of God through Jesus Christ."

Fourthly, "That this divine grace, or energy of the Holy Ghost, begins and perfects every thing that can be called good in man, and consequently all good works are to be attributed to God alone, that, nevertheless, this grace is offered to all, and does not force men to act against their inclination, but may be resisted, and rendered ineffectual, by the perverse will of the impenitent sinner."—Some modern Arminians interpret this and the last article with a greater latitude.

Fifthly, "That God gives to the truly faithful, who are regenerated by his grace, the means of preserving themselves in this state," and though the first Arminius made some doubt with respect to the closing part of this article, their followers uniformly maintain, that the regenerate may lose true justifying faith, forfeit their state of grace, and die in their sins.

The modern system of Arminianism likewise extends the limits of the Christian church in such a manner, that Christians of all sects and denominations, papists excepted, may be formed into one religious body, and live together in brotherly love and concord. The Arminians are also called Remonstrants, from a humble petition entitled Remonstrance, which in the year 1610 they addressed to the States of Holland. Their principal writers are Arminius, Episcopius, Vossius, Grotius, Curcellæus, Limborch, Le Clerc, Wetstein, and many others of more modern date.

ARMINIUS (James), a Dutch divine, was born at Oudewater, in 1560. He lost his father in his infancy, and his mother, sister, and brothers, were butchered by the Spaniards while he was at Marburg, in 1575. He afterwards studied at Leyden and Geneva, from whence he travelled into Italy, and spent some time at Padua. In 1588 he was ordained, and soon became a popular preacher. About this

time Leidesius, theological professor at Franeker, desired him to refute a piece which had been written against Beza on predestination, by some divines at Delft. In studying this point Arminius became a convert to the opinion which he was employed to confute. In 1603 he was appointed professor of divinity at Leyden, where his lectures made a great noise, and brought off many from the rigid doctrines which had hitherto prevailed on the divine decrees. His great adversary was Gomarus, with whom he held several conferences. In 1607 he wrote an admirable apology to the elector palatine, respecting the disputes in which he was then engaged on the controverted points. It is supposed that these fierce discussions occasioned the illness of which he died, in 1609.

Arminius was esteemed an excellent preacher: his voice was low, but very agreeable, and his pronunciation admirable. He was easy and affable to persons of all ranks, and factious in his conversation amongst his friends. His great desire was, that Christians would bear with one another in all controversies which did not affect the fundamentals of their religion, and when they persecuted each other for points of indifference, it gave him the utmost dissatisfaction. The curators of the university of Leyden had so great a regard for him, that they settled a pension upon his wife and children.

He left several works, viz. 1 Disputationes de diversis Christianæ religionis capitibus. 2 Orationes, itemque tractatus insigniores aliquot. 3 Examen modesti libelli Gulielmi Perkinsi de prædestinationis modo et ordine, itemque de amplitudine gratiæ divinæ. 4 Analysis capitis noni ad Romanos. 5 Dissertatio de vero et genuino se usu capitis septimi epistolæ ad Romanos. 6 Amica collatio cum D. Francisco Junio de prædestinatione per literas habita. 7 Epistola ad Hippolytum a collibus.

ARMIPOTENCE *s* (from *arma* and *potentia*, Lat.) Power in war.

ARMIPOTENT *a* (*armipotens*, Latin.) Powerful in arms, mighty in war (*Dryden*).

ARMISTICE *s* (*armistitium*, Lat.) A short truce.

ARMLLT *s* (from *arm*.) 1 A little arm. 2 A piece of armour for the arm. 3 A bracelet for the arm (*Donne*).

ARMOISIN, a silk stuff, or kind of taffety, manufactured in the East Indies, also at Lyons, and at Lucca.

ARMONACK *s* (erroneously so written for *ummonack*.) A sort of volatile salt. See AMMONIACK.

ARMONICA, (from *armonia*, *harmony*.) is a name which Dr. Franklin has given to a musical instrument constructed with drinking-glasses. It is well known, that a drinking-glass yields a sweet tone, by passing a wet finger round its brim. Mr. Puckeridge, of Ireland, was the first who thought of playing tunes formed of these tones. He collected a number of glasses of different sizes, fixed them near each other on a table, and tuned them by

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putting it to them water, more or less, as each note required. Mr Delaval, F R S made an instrument in imitation of that which was contrived by Mr Puckeridge, and from this instrument, Dr Franklin took the hint of constructing his armonica.

The glasses for this musical instrument are blown as near as possible in the form of hemispheres, having each in open neck or socket in the middle. The thickness of the glass near the brim is about one tenth of an inch, increasing towards the neck, which in the largest glasses is about an inch deep, and an inch and a half wide within, but these dimensions lessen, as the size of the glasses diminishes, only observing that the neck of the smallest should not be shorter than half an inch. The diameter of the largest glass is nine inches, and that of the smallest three inches between these there are twenty-three different sizes, differing from each other a quarter of an inch in diameter. For making a single instrument, there should be at least six glasses blown of each size, and out of these, thirty seven glasses (which are sufficient for three octaves, with all the semitones) may be found, that will either yield the note required, or one a little sharper, and fitting so well into each other, as to taper regularly from the largest to the smallest. The glasses being chosen, and the note for which each glass is intended being marked upon it with a diamond, they are to be tuned by diminishing the thickness of those that are too sharp, which is done by grinding them round from the neck towards the brim, comparing, by means of a well tuned harpsichord, the tone drawn from the glass by our finger, with the note you want, as sounded by the corresponding ring of the harpsichord. The largest glass in the instrument is G, a little below the reach of a common voice, and the highest G, including three complete octaves, and they are distinguished by painting the appurtenant parts of the glasses withinside, every semitone white, and the other notes of the octave with the seven primitive colours, so that glasses of the same colour (the white excepted) are always octave to each other.

When the glasses are tuned they are to be fixed on a round spindle of hard iron, an inch in diameter at the thickest end, and tapering to a quarter of an inch at the smallest. For this purpose, the neck of each glass is fitted with a cork, projecting a little without the neck, these corks are perforated with holes of different diameters, according to the dimension of the spindle in that part of it where they are to be fixed. The glasses are all placed within one another, the largest on the biggest end of the spindle, with the neck outwards, the next in size is put into the other, leaving about an inch of its brim above the brim of the first, and the others are put on in the same order. From these exposed parts of each glass, the tone is drawn, by laying a finger upon one of them, as the spindle and glasses turn round. The spindle thus prepared, is fixed horizontally in the middle of a box, and made to turn on

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brass gudgeons at each end. A square shank comes from its thickest end through the box, on which shank a wheel is fixed by a crew; this will serve, like a fly, to make the motion equable, when the spindle is turned by the foot like a spinning wheel. The wheel is eighteen inches in diameter, and conceals near its circumference about twenty-five pounds of lead, and may be made of mahogany. An ivory pin is fixed in the face of the wheel, about four inches from the axis, over which is put the loop of the string that comes up from the moveable step to give it motion. The box is about three feet long, eleven inches wide at the biggest end, and five inches at the smallest end. It is made with a lid, which opens at the middle of its height, and turns up by hinges. The instrument, thus completed, stands on a neat frame with four legs. This instrument is played upon by sitting before it, as before the keys of a harpsichord, turning the spindle with the foot, and wetting the glasses now and then with a sponge and clean water. The fingers should be first soaked in water and rubbed occasionally with fine chalk, to make them catch the glass, and bring out the tone more readily. Different parts may be played together, by using both hands, and the tones are best drawn out, when the glasses turn from the ends of the fingers, not when they turn to them.

The advantages of this instrument are, that its tones are incomparably sweet beyond those of any other, that they may be swelled and softened at pleasure, by stronger or weaker pressures of the finger, and continued to any length.

**ARMORACIA** (*Armoracia*, from *Armoricana*, the country from whence it was brought) See **RAPHANUS RUSTICANUS**.

**ARMORILL** *s* (*armorier*, Fr) 1 He that makes armour, or weapons (*Pop*) 2 He that dresses another in armour (*Shakespeare*)

**ARMORIAL** *a* (*armorial*, Fr) Belonging to the arms or escutcheons of a family.

**ARMORICA**, the name anciently given to all the northern and western part of Gaul. It denotes the same as our word maritime.

**ARMORIS** *s* (from *a • iour*) A person skilled in heraldry.

**ARMOUR**, a defensive habit, wherewith to cover and secure the body from the effects of any offensive weapon. In ancient statutes this is frequently called harness. A complete armour anciently consisted of a casque or helm, a gorget, cuirass, gantlets, tasset, brasses, cuisses, and covers for the legs, to which the spurs were fastened. This they called armour cap-a-pie, and was worn by cavaliers and men at arms. The infantry had only part of it, viz a pot or head piece, a cuirass and tasset, but all of them made light. Lastly, the horses themselves had their armour, where with to cover the head and neck. Of all this furniture of war, scarcely any thing is now retained except the cuirass, the gorget or neck piece, worn by officers being at present only a badge of honour, and of no defence.

**ARMOUR, CREST**, is the escutcheon of any



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person, or family, with its several charges and other furniture, as mantling, crest, supporters, mottoes, &c. Thus we say, a gentleman of coat-armour, meaning one who bears arms.

**ARMOUR-BEARER** *s* (from *armour* and *bear*) He that carries the armour of another (*Dryden*)

**ARMOURER**, a maker of arms or armour  
See **ARMORER**

**ARMOURER OF A SHIP**, a person whose office is to take care that the arms be in a condition fit for service

**ARMOURY**, a store-house of arms, or a place wherein military habiliments are kept, to be ready for use. There are armouries in the Tower, and in all arsenals, citadels, castles, &c.

**ARMOURY** is also used for a branch of heraldry, being the knowledge of coat-armours, as to their blazons, and various intendments

**ARMPIT** *s* (from *arm* and *pit*) The hollow place under the shoulder (*Swift*)

**ARMS**, **ARMA**, in a general sense, includes all kinds of weapons, whether for defence or offence. Nicod derives the word from the Latin phrase *quod operantur armos*, because they cover the shoulders or sides, but Virro derives *arma*, ab *arcendo*, eo quod arceant hostes. It is supposed that the first artificial arms were of wood, and were only employed against beasts. Arms of stone, and even of brass, appear to have been used before they came to iron and steel. Josephus assures us, that the patriarch Joseph first taught the use of iron arms in Egypt, arming the troops of Pharaoh with a casque and buckler. The principal arms of the ancient Britons were hatchets, scythes, lances, swords, and bucklers. The Saxons, &c. brought in the halbert, bow, arrows, arbalets, &c.

**ARMS** (*Arma*) In botany, *Muerones arcentes animalia, ne lædant plantam*. Thorns, prickles, and stings, with which plants are furnished for their defence. Enumerated among the *Fulcres*. See **FULCRUM**, **PRICKLE**, **STINGS**, **THORN**

**ARMS**, (*arma*), in law, are extended to any thing which a man takes in his hand in his wrath, to cast at, or strike another. By the common law, it is an offence for persons to go or ride armed with dangerous weapons, but gentlemen may wear common armour, according to their quality, &c. 3d Inst. The king may prohibit force of arms, and punish offenders according to law; and herein every subject is bound to be aiding

**Fire-arms** are those charged with powder and ball, such are cannon, mortars, and other ordnance, muskets, carbines, pistols, and even bombs, granadoes, carcasses, &c. The pistol was invented at Pistoye a town of Tuscany, and was introduced into England about 1550

**ARMS** is used figuratively for the profession of a soldier. Thus we say, he was bred to arms

**ARMS**, or **ARMORIES**, are also used in heraldry for marks of dignity and honour, regularly composed of certain figures and colours

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given or authorised by sovereigns, and borne in banners, shields, coats, &c. for the distinction of persons, families, and states, and passing by descent to posterity. They were called arms, because they were borne principally on the buckler, cuirass, banners, and other apparatus of war. They are also called coats of arms, coat armour, &c. because anciently embroidered on sur-couts, &c. Some will have the name to have been first occasioned by the ancient knights, who in their jousts and tournaments bore certain marks, which were frequently their mistresses' favours, in their helmets or shields to distinguish them from each other. Arms, at present, follow the nature of titles, which being made hereditary, these are also become so, being the several marks for distinguishing of families and kindreds, as names are of persons and individuals

Arms are distinguished by different names, to denote the causes of their bearing, such as arms of Dominion,—of Preterition,—of Concession,—of Community,—of Patronage,—of Family,—of Alliance,—of Succession

Arms of Dominion, or overcignty, are those which emperors, kings, and sovereign states do constantly bear, being, as it were, annexed to the territories, kingdoms, and provinces they possess. Thus the three lions are the arms of England, the harp those of Ireland, &c.

Arms of Preterition, are those of such kingdoms, provinces, or territories, to which a prince or lord has some claim, and which he adds to his own, although the said kingdoms or territories be possessed by a foreign prince or other lord. Thus the kings of England have quartered the arms of France with their own ever since Edward III. laid claim to the kingdom of France, which happened in the year 1330, on account of his being son to Isabella, sister to Charles the Handsome, who died without issue

Arms of Concession, or augmentation of honour, are either entire arms, or else one or more figures, given by princes as a reward for some extraordinary service. We read in history that Robert Bruce, king of Scotland, allowed the earl of Winton's ancestor to bear, in his coat of armour, a crown supported by a sword, to show that he, and the clan Seaton, of which he was the head, supported his tottering crown. The late queen Anne granted to sir Cloudesley Shovel, rear-admiral of Great Britain, a chevron between two fleurs-de-lis in chief, and a crescent in base, to denote three great victories he had gained, two over the French, and one over the Dutch

Arms of Community, are those of bishoprics, cities, universities, academies, societies, companies, and other bodies corporate

Arms of Patronage, are such as governors of provinces, lords of manors, patrons of benefices, &c. add to their family arms, as a token of their superiority, rights, and jurisdiction. These arms have introduced into heraldry, castles, gates, wheels, ploughs, rakes, harrows, &c.

Arms of Family, or paternal arms, are those that belong to one particular family, that dis-

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attinguish it from others, and which no person is suffered to assume without committing a crime which sovereigns have a right to restrain and punish

**Arms of Alliance**, are those which families, or private persons, take up and join to their own, to denote the alliances they have contracted by marriage. This sort of arms is either impaled, or borne in an escutcheon of pretence, by those who have married heiresses.

**Arms of Succession**, are such as are taken up by them who inherit certain estates, manors, &c. either by will, entail, or donation, and which they either impale or quarter with their own arms, which multiplies the titles of some families out of necessity, and not through ostentation, as many imagine.

These are the eight classes under which the different sorts of arms are generally ranged, but there is a sort which blazoners call assumptive arms, being such as are taken up by the caprice or fancy of upstarts, though of ever so mean extraction, who, being advanced to a degree of fortune, assume them without legal title. This, indeed is a great abuse of heraldry, and common only in Britain, for on the continent no such practice takes place.

*Arms, pass of*, a combat among the ancient cavaliers.

*Arms, stand of*, contains a musket, a bayonet, sword, belt, and cartridge box.

*Arms of parade*, those used in the ancient tournaments as unshod lances, wooden swords, &c.

**ARMSTRONG** (John), a poet and physician was born at Castleton in Roxburgshire, where his father and brother were ministers. He took his degree of M.D. at Edinburgh, in 1732. In 1735 he published an anonymous tract, entitled, *An Essay for ibridging the Study of Physic*. In 1737 appeared his *Synopsis of the History and Cure of the Venereal Disease* 8vo. Not long after came out his *Economy of Love*, a poem, in which he has caught the spirit of Ovid with his licentiousness. In the edition of 1768, the author purged this piece of many offensive passages; it is still however so obscene, as to render it impossible to recommend it to general perusal, although it contains many beautiful passages. In 1744 he published *The Art of preserving Health*, one of the best didactic poems in our language. In 1746 he was appointed one of the physicians to the military hospital behind Buckingham house. In 1758, he printed *Sketches, or Essays on various Subjects*, by Launcelot Temple, esq. In 1760 he was appointed physician to the army in Germany, and the next year wrote a poem called *Day*, in Epistle to John Wilkes of Aylesbury, esq. In the letter he threw out a reflection upon Churchill, which drew on him the resentment of that satirist. Dr Armstrong published a collection of *Miscellanies* in 1770, in 2 vols. 12mo and the year following, a short *Ramble through some Parts of France and Italy*, by Launcelot Temple. In 1773 appeared his *Medical Essays*, in 1 vol. 4to. He died in 1779.

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**ARMUYDEN**, a sea-port town of Zealand, one of the Seven United Provinces. It was once a flourishing town, but is now considerable, its harbour being stopped up. Its salt-works are its chief resource. Lat 51 31 N Long 3 42 E.

**ARMY**, a large number of soldiers, consisting of horse and foot, completely armed, and provided with artillery, ammunition, provision, &c. under the command of one general, having lieutenant generals, major generals, brigadiers, and other officers, under him. An army is composed of squadrons and battalions, and is usually divided into three corps, and formed into three lines. The first line is called the vanguard, the second the main body, and the third the rear guard, or body of reserve. The centre is possessed by the foot, the cavalry form the right and left wing of each line, and sometimes they place squadrons of horse in the intervals between the battalions. When the army is drawn up in order of battle, the horse are placed at five hundred paces from each other, and the foot at three. In each line the battalions are distant from each other 180 feet, which is nearly equal to the extent of their front, and the same holds good of the squadrons which are about 300 feet distant, the extent of their own front. These intervals are left for the squadrons and battalions of the second line to range themselves against the intervals of the first, that both may more readily march through these spaces to the enemy. The first line is usually 300 feet distant from the second, and the second from the third, that there may be sufficient room to rally when the squadrons and battalions are broken.

An army sometimes acquires different appellations from the particular service in which it is employed. A covering army is that which covers a place, by lying encamped for the protection of the different passes which lead to the principal object of defence. An army is said to blockade a place when being well provided with heavy artillery &c. it is employed to invest a town for the purpose of reducing it by assault or famine. An army of observation is so called because by its advanced positions and desultory movements, it is constantly employed in watching the enemy. Such is a body of troops engaged by besiegers to prevent relief being brought into a place, or the siege being raised by the enemy. An army of reserve is a sort of general depot for effective service. In cases of emergency, the whole, or part of an army of reserve, is employed to recover a lost day, or to secure a victory. A flying army is a strong body of horse and foot, usually commanded by a lieutenant-general, which is always in motion, to cover its own garrisons, or to keep the enemy in perpetual alarm.

The first standing army that appeared in Europe, after the fall of the Roman legions was that established in France by Charles VII. A.D. 1445. Such an establishment however was so repugnant to the genius of feudal policy and so incompatible with the principles and

pretensions of the nobility, that during several centuries no monarch was either so bold or so powerful as to venture on any step towards introducing it. Charles VII. under pretence of keeping always on foot a force sufficient to defend the kingdom against any sudden invasion of the English, when he disbanded his other troops, retained under arms a body of 9000 cavalry, and of 16000 infantry.

The first standing military force in Britain was that garrison in Dover castle, which by resisting the arms of the dauphin of France, invited by the barons to their succour in their contest with King John, saved the kingdom of England from a foreign dynasty.

The regular army established by Charles II. consisted at first of little more than 5000 men, including garrisons abroad. In 1684 the standing army amounted to 8000 men, that on the Irish establishment having been at the same time augmented to 7000. During the two succeeding reigns the army was much increased, as the nation was engaged in continental war. Under Geo. I. in 1717, the force voted by parliament amounted to 16000 men. The standing army was much augmented during the following reign on account of foreign wars and internal disturbances. Every successive war has increased the establishment of the army in proportion to our acquisition of foreign territory. At the conclusion of the American contest, the forces were reduced to about 40000 men for Great Britain and Ireland, and the peace establishment of 1802 consisted of 113,000 men, including 17,000 cavalry, six regiments of colour in the West Indies amounting to 4758 men, and 1 regiment of Swiss, &c. &c. limited to 500. See CAVALRY, & INFANTRY, FOOT, GREENADILERS, GUARDS, &c.

ARNA, or ARNE, a small territory of Greece, in Thessaly, the name of which, as well as that of its metropolis, were derived from Arne the daughter of Iolaus, by whose son Boeotia it was built.

ARNAILL, a fortified island on the western coast of the higher peninsula of India, commanding the entrance of the Angisvally or Mandavee river, between Bombay and Surat.

ARNDORF, a town of Germany, in the circle of Bavaria, and principality of Saltzbach, four miles east of Fehrmitt.

ARNE (Thomas Augustine), an English musician, was born in 1710. His father was an upholsterer in Covent garden. He had his education at Eton, and was afterwards articled to an attorney, but music had more charms for him than the law, and he soon left the desk for the fiddle. His proficiency was so great, that in no long time he was engaged as leader of the band at Drury-lane, and in 1733 he composed the music for Adonis's opera of Rosamond, which was received with universal applause. In 1738, he acquired great credit by setting Milton's Comus. In 1740 he set Malley's masque of Alfred, in which first appeared the song of Luke the butler. He had great success in setting popular ballads to music.

In 1759, the university of Oxford conferred on him the degree of doctor of music. He died in 1778, of a spasm of the lungs.

ARNEHEIM, a town of Guelderland, belonging to the United Provinces. It is an ancient city, and was surrounded by a wall built by Otho IV. count of Guelderland. Lat 52° 2' N. Lon 5° 50' E.

ARNICA. In botany, a genus of the class and order syngenesia, polygamia superflua. Receptacle naked, down simple, calyx equal, florets of the margin generally with five filaments destitute of anthers. Twenty four species, chiefly natives of the Alps and the Cape. (The name is Greek, ἀρνί, from ἀρ, a lamb, because of the likeness of the leaf of this plant to the coat of the lamb.) The Doxoneum germanicum Mountain Arica Arica montana of Linn. Arica foliis ovatis integris, caulibus pinnatis oppositis, constitutes an article in various pharmacopœias. The flowers of this plant are very generally employed on the continent. Of the advantages derived from their use in palsy and other affections depending upon a want of nervous energy, there are several proofs, and their extraordinary virtues as a febrifuge and antieptic, have been highly extolled. Much caution is necessary in regulating the dose, as it is a medicine very apt to produce vomiting and much uneasiness of the stomach.

ARNICA MONTANA. The systematic name for the arnica of the pharmacopœias. See ARNICA.

ARNICA SUECENSIS. See ONYFAMEDIA.

ARNO, the most considerable river of Tuscany, in Italy. It rises in Florence and falls into the Tuscan Sea, a little below Pisa.

ARNOLD of Brescia, an Italian, distinguished himself by being the founder of a sect, which opposed the wealth and power of the Romish clergy. He went into France, where he studied under the celebrated Peter Abelard. Upon his return to Italy, he put on the habit of a monk, and maintained his opinions, that the pope and the clergy ought not to enjoy any temporal estate, and that those ecclesiastics who had any estates of their own, or held any lands, were entirely cut off from the least hopes of salvation; that the clergy ought to subsist upon the alms and voluntary contributions of Christians, and that all other revenues belonged to prince and states, in order to be disposed of amongst the laity, as they thought proper. He maintained also several heresies, with regard to baptism and the Lord's supper. St. Bernard has drawn his character in very strong colours. Would to God (say he) that his doctrine was as holy as his life is strict: would you know what sort of man this is? Arnold of Brescia is a man that neither eats nor drinks, who like the devil, is hungry and thirsty after the blood of souls, who goes to and fro upon the earth, and is always doing among strangers what he cannot do amongst his own countrymen: who ranges like a roaring lion, always seeking whom he may devour: an enemy to the cross of Christ, an author of disorders, an inventor of schism,

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and a disturber of the public peace he is a man, whose conversation has nothing but sweetness, and his doctrine nothing but poison in it, a man who has the head of a dove, and the tail of a scorpion." He engaged a great number of persons in his party, who were distinguished by his name, and proved very formidable to the popes. His doctrines rendered him so obnoxious, that he was condemned in the year 1139, in a council of near 1000 prelates, held in the church of St. John Lateran at Rome, under pope Innocent II. Upon this he left Italy, and retired to Switzerland. After the death of that pope, he returned to Italy, and went to Rome, where he roused a sedition against pope Eugenius III. and afterwards against Hadrian IV. who laid the people of Rome under an interdict till they had banished Arnold and his followers. This had its desired effect: the Romans seized upon the houses which the Arnoldists had fortified, and obliged them to retire to Otricoli in Fuscany, where they were received with the utmost affection by the people who considered Arnold as a prophet. However, he was seized some time after by cardinal Gerard, and, notwithstanding the efforts of the counts of Cambrino, who had rescued him, he was carried to Rome, and condemned by Peter, the prefect of that city, to be hanged, and was accordingly executed in the year 1155. Thirty of his followers went from France to Friesland, about the year 1160, in order to propagate their doctrine there, but they were immediately seized and destroyed.

**ARNOLD** (Samuel, Mus. D.) an eminent musical composer, was born in the year 1730, and manifested early indications of those talents for which he was afterwards so celebrated. He received his musical education at the Chapel Royal, St. James's, and was not long before he distinguished himself by that lively little air "If 'tis joy to wound a lover," a popular piece which was soon followed by others evincing much genius and a correct taste. About 1760 he became a regular composer for Covent garden theatre, and in 1766 he was appointed to conduct the musical department at the Haymarket theatre. In 1767 he made choice of the "Cure of Saul," for the subject of his first effort in the higher style of musical composition. His performance was long allowed to be the best in its kind since the time of Handel. It was followed by the oratorios of "Abimelech," the "Resurrection," and the "Prodigal Son," the latter of which reflects the highest honour on his judgment and genius. In 1773 this gentleman received his doctor's degree at Oxford, and in 1783 was appointed successor to Dr. Nares, as organist and composer for the Chapel Royal, St. James's. In 1796, he succeeded Dr. Hayes as conductor of the annual performances at St. Paul's for the feast of the sons of the clergy, and in this situation he uniformly maintained his distinguished character, as a musical professor. He died on the 22d of October, 1802.

The oratorios of Dr. Arnold are not un-

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worthy the disciple of so great a master as Handel, but such was the versatility of his talents that he distinguished himself equally in those tender, playful, and humorous compositions which furnish so great a portion of our public amusements. The "Mad of the Mill," the "Agreeable Surprise," "Ince and Yanco," the "Shipwreck," "Peeping Tom," and the "Shunamite Woman," will continue to delight until the rage for novelty destroys the love of excellence.

**ARNOLDUS** (Gothofredus), pastor and inspector of the churches of Perleberg, and historiographer to the king of Prussia, was born at Annaburg in the mountains of Misnia, in 1666. He was a zealous defender of Pietists, a sect among the German Protestants, and composed a great number of religious works, particularly an Ecclesiastical History, which exposed him to the resentment of the divines, and another giving an account of the doctrines and manners from the first ages, in which he frequently animadverts upon *Civis* Primitive Christianity. He died in 1714. Various are the opinions concerning Arnoldus in Germany, some of his own countrymen and profession extolling him to the skies as a saint of the last century, and setting an inestimable value upon his works, while others pronounce damnation upon him as an arch-hetic, and condemn his writings as heterodox.

**ARNON**, in ancient geography, a rapid river of Palestine, which had its source among the mountains of Galilee, and by its course towards the Red Sea divide the Amorites from the Moabites.

**ARNOPOGON** In botany, a genus of the class and order *yncastrin* polygon in aquilis. Receptacle naked down feathers on a pedicel, calyx one leaved, eight pointed turbinate. Four species natives of the Cape or South of Europe.

**ARNOTIO** See *BIXA*.

**ARNOTTO** (*Spanish*) See *GALLANA*.

**ARNSTADT**, a town of Germany in the palatinate of the Rhine, eight miles from Crutzenach.

**AROMA**, or **SPIRITUS RECTOR**, (from *arō* intensely, and *osmō*, to smell,) is the odorate principle of plants, or that, whatever it be, to which they owe their smell. The term *spiritus rector* was originally of more extensive signification, having been employed by the ancient chemists to designate the peculiar characteristic of all bodies, or that presiding spirit or aura by which any one body was supposed to be distinguished from every other. Its restriction to the order of vegetables was occasioned by the facility with which those substances almost exclusively possess, of furnishing the essential oil or peculiar vehicle in which the spirit was supposed to reside, or to which it was indissolubly attached.

Of the nature of aroma we know very little being still ignorant whether the powerful scent of a plant be owing to some substance of so delicate a nature as to have eluded our research,

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or whether it is only an inherent quality in some known part of the plant, e g the essential oil, which by being volatilized in the air is able to reach our olfactory organs. Accordingly chemists have been divided in their opinion whether the difference of odour in plants is to be ascribed to a distinct and peculiar species of aroma existing in each, or to the same principle in different degrees and combinations.

The separation of this principle from the plants in which it resides has long been known in the form of essences, distilled waters, or spirits, aromatic waters, &c which are much used in pharmacy, and perfumery, and each of which retains the characteristic scent or odour of the plant from which it is procured.

**AROMATIC AL AROMA'TICK** *a* (from *aroma*, *I at spice*) 1 *Spicy* (*Bacon*) 2 *Fragrant*, strong scented (*Pope*)

**AROMA TIC VINEGAR**, a preparation invented by Mr William Henry, sen of Manchester. It is a solution of camphor and various essential oils in the acetic acid or rancid vinegar, it possesses a most pungent and agreeable odour, and is extremely useful in preventing the contagion of infectious diseases, and in removing pains in the head, &c.

**AROMATICS** (*aromatica, ἀρωματικά* *arōma, an odour*) A term applied to all medicinals which have a grateful spicy scent, and an agreeable pungent taste, as cinnamon, bark, cardimomis, &c.

**AROMATIZATION** (from *aroma* *ize*) The act of scenting with spices.

**TO AROMATIZE** *v c* (from *aroma*, *I at spice*) 1 *To* with spices, to impregnate with spices (*Bacon*) 2 *To* scent, to perfume (*Brown*)

**ARONIA** in botany. See **ORONTIUM**

**ARORCILS** See **CAENGAL**

**AROOBS'**, a territory of Abyssinia being the southernmost division of Mait ha, on the west side of the Nile, inhabited by the Abyssinian, a kindred of the Amos. It is bounded on the north by the river Kedu, and on the south by the A.

**AROMI**, a contraction of *aroma philosophorum*, a name given to siffion. Arophi Paracelsi, a kind of chemical flowers elegantly prepared by subliming or fusing equal quantities of lapis hæmatitis and sal ammoniac. Arophi is also a term used by Paracelsus to denote a medicine said by him to dissolve the stone in the human body, in which sense it is synonymous with *lithontripic*.

**AROSE** The pretent of the verb *arise*

**AROUND** *ad* (from *a* and *round*) 1 *In* circle (*Dryden*) 2 *On every side* (*Dry*)

**AROUND** *prep* About, encircling, so as to encompass (*Dryden*)

**TO AROUSE** *v a* (*a* and *rouse*) 1 *To* wake from sleep (*Shakspeare*) 2 *To* rouse up, to excite (*Furness*)

**AROW** *ad* (*a* and *row*) In a row (*S d*)

**AROWNT** *va* Begone, away (*Shak*)

**ARPA** *us*, or **HARPAGUS** among the ancients a person who died in the cradle at least by violence. This word is formed from

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the Greek *ἄρπάζω*, *I snatch*. The Romans made no funerals for their *arpagi*. They neither burnt their bodies, nor made tombs, monuments, or epitaphs for them. In after times, it became the custom to burn such as had lived to the age of 40 days, and had cut any teeth, and these they called *Ἀρπαγοί*, or *Ἀρπαγιστοί* q d *rapti, ravished*.

**ARPEGIO**, the manner of making the several notes of a chord in music be distinctly heard one after another, by a melodious purling and rolling motion of the hand, particularly on stringed instruments, always beginning at the ground, or lowest note, and rising gradually upwards—this is to imitate harp music.

**ARPEGGIO ACCOMPANIMENT** An accompaniment the passages of which chiefly consist of the intervals of the several chords, taken in succession.

**ARPEN**, signifies an acre or furlong of ground, and according to the old French account in Doom day book, 100 perches make an arpen. The most ordinary acre, called *l'arpent de France*, is 100 perches square but some account it out half an acre.

**ARPINO**, a town of Terra di Lavoro, in Naples. Lat 41 44 N Lon 13 40 E.

**ARPINUM**, a city of the Volsci, famous for being the birth place of Marius and Cicero now called Arpino.

**ARQUEBUSADE** *Aqua sclopetaria* (This is a French word from *arquebuse* a hand-gun and consequently implying good for a gun shot wound). The name of a spirituous water distilled from a mixture of aromatic plants.

**ARQUEBUSE** A hand-gun (*Bacon*)

**ARQUEBUSIER** (from *arquebuse*) A soldier armed with an arquebuse (*Knolles*)

**ARRACAN** See **ARACAN**

**ARRACHIL** in heraldry a term applied to the representations of plants torn up by the roots.

**ARRACK** (Indian) 1 Rice—2 A spirituous liquor distilled from rice and drank in the rice countries as we do brandy in this island. Its effects on the human economy are the same. See **BRANDY**.

**ARRAGON**, one of the most considerable provinces of Spain, formerly a kingdom. It is bounded on the N by the Pyrenees which separate it from France, by Old and New Castile on the W by Valencia on the S and by part of Valencia and Catalonia on the E. It is fertile in corn, wine, flax and fruit, and was united in 1478 to the crown of Spain.

**ARRAGONITE**, In oryctology, a genus of the class carths, order calcareous. It is thus denominated by Haüy and Brochant, but by Linnæus, *Fassentischer kalkstein*. It consists of carbonate of lime and phosphoric acid is brittle, hardish, easily frangible, effervesces with acid, when pulverised and spread on hot coals emits a feeble phosphorescent light of a greenish hue. It appears, hence, to be scarcely more than a species of apatite, which see. Yet as Klapproth and Vauchelin, in opposition to Werner, have asserted that its acid is solely carbonic instead of phosphoric, we have in-

roduced it here as a distinct genus. There is but one species, which is found in the province of Arragon in Spain, whence it derives its name, imbedded in gypsum, in fluor spar in the valley of Leogany in Salzburg, and occasionally in France and the Pyrenean mountains. Colour greenish green and pearl-grey, the former passing into mountain-green, the latter into pale violet-blue. Specific gravity 2.9465.

**ARRAIGN** *v a* (*arranger*, Fr) to set in order) 1 To set a thing in order, or in regularity. 2 A prisoner is said to be *arraigned*, when he is brought forth to his trial (*Cowell*). 2 To accuse, to charge with faults in general, as in controversy or in strife (*South*).

**ARRAIGNMENT**, in law, the arraigning or setting a thing in order, as a person is said to arraign a writ of novel disseisin, who prepares and fits it for trial. The term is most properly used to call a person to answer in form of law upon an indictment &c. When brought to the bar, the criminal is called upon by name to hold up his hand, which though it may seem a trifling circumstance, yet it is of this importance that by holding up of his hand, he testifies to the court that he owns himself to be of that name by which he is called. However, it is of no indispensable ceremony, for being calculated merely for the purpose of identifying the person, any other acknowledgment it will answer the purpose is well therefore if the prisoner obstinately and contemptuously refuses to hold up his hand, but confesses he is the person named, it is fully sufficient. In the indictment is to be read to him distinctly in the English tongue (which was law even while all other proceedings were in Latin) that he may fully understand his charge. After which it is to be demanded of him whether he be guilty of the crime whereof he stands indicted, or not guilty? When a criminal is arraigned, he either stands mute, or confesses the fact, or else he pleads to the indictment. 1 If he says nothing, the court ought ex officio to impanel a jury to enquire whether the tandsob match mute or whether he be dumb ex vi titione Dei. If the latter appears to be the case, the judges of the court (who are to be of counsel for the prisoner, and to see that he hath law and justice) shall proceed to the trial, and examine all points as if he had pleaded not guilty. But whether judgment of death can be given against such a prisoner, who hath never pleaded, and can say nothing in respect of judgment, is a point yet undetermined. — If he be found to be obstinately mute (which a prisoner hath been held to be that he cut out his own tongue,) then, if he be on an indictment of high treason, it hath long been clearly settled, that standing mute is equivalent to a conviction, and he shall receive the same judgment and execution. — The English judgment of penance for standing mute was, till of late years, a species of torture, effected by loading the body of the prisoner with heavy weights till a plea of some kind was drawn from him, but the doubts entertained as to its legality, and the repugnance of its theory to the

humanity of the laws of England, concurred to require a legislative abolition of this cruel process, and a restitution of the ancient common law, whereby the standing mute in felony, as well as in treason and in trespass, amounted to a confession of the charge. — 2 If the prisoner make a simple and plain confession, the court hath nothing to do but to award judgment. but it is usually very backward in receiving and recording such confession, out of tenderness to the life of the subject, and will generally advise the prisoner to retract it and, — 3 Plead to the indictment, is to which, see the article **PLEA OR INDICTMENT**.

**ARRANGE** *v a* (*arranger*, Fr) to put in the proper order for any purpose (*Cheyne*).

**ARRANGEMENT** *s* (from *arrange*) The act of putting in proper order, the state of being put in order (*Chambers*).

**ARRANGEMENTS** (*philosophical*), a title given by the late learned Mr Harris, of Salisbury, to an excellent commentary on the categories of Aristotle, being as happy a simplification of logic, as his *Hermes* is of grammar.

**ARRANT** *a* (from *erant*) Bad in a high degree (*Dryden*).

**ARRANTLY** *ad* (from *arrant*) Corruptly, illicitly (*L'Esrange*).

**ARRAS** *s* (from *Arras*, a town in Artois) A tuncery (*De Ham*).

**ARRAUGHT** *a* Seized by violence out of use (*Spenser*).

**ARRAY** *s* (*array*, Fr) 1 Order, chiefly of war (*Hilton*). 2 Dress (*Dryden*). 3 [In law] The ranking or setting forth of a jury impanelled on a cause (*Cowell*).

**ARRA'Y** *a* (*arrayer*, old Fr) 1 To put in order. 2 To dress (*Dryden*).

**ARRA'YERS** *s* (from *array*) Officers who anciently had the care of seeing the soldiers duly appointed in their armour (*Cowell*).

**ARRER** *ad* (*arriere*, Fr) Behind. The primitive signification, though not now in use (*Spenser*).

**ARRER** *s* That which remains behind unpaid, though due (*Locke*).

**ARRERAGE** *s* The remainder of an account, or, more generally, any money unpaid at the due time (*Cowell*).

**ARRLNIATION** (from *arrendar*, Span to farm) The licensing in owner of lands in the forest to enclose them.

**ARR'PTIOUS** *a* (*arceptus*, Lat) 1 Snatched away. 2 (from *ad* and *repo*) Crept in privily.

**ARREST** *v a* (*arrestor*, Fr) 1 To seize by a mandate from a court (*Shakspeare*). 2 To seize any thing by law (*Shakspeare*). 3 To seize, to lay hands on (*South*). 4 To withhold, to hinder (*Davies*). 5 To stop motion (*Boyle*).

**ARREST** *s* A mangey humour between the hani and pastern of the hinder legs of a horse.

**ARREST**, in common law, the apprehending or restraining of one's person, in execution of the command of some court, or officer of

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**justice** The word *arrest* is French, and is used in that language for a decree or determination of a cause debated to and fro in which sense it seems derived from *arrestus*, *placitum*, the pleasure of the court. Hence, when a person is legally stopped, apprehended, and restrained of his liberty, for debt, &c. he is said to be *arrested*, or put under an *arrest*, which is the beginning of imprisonment. None shall be arrested for debt, trespass, &c. or other cause of action, but by virtue of a precept or commandment out of some court, but for treason, felony, or breach of the peace, a man may arrest without precept or warrant.

**ARREST OF JUDGMENT**, in law, the assigning just reason why judgment should not pass, as, want of notice of the trial, a material defect in the pleading, when the record differs from the deed impleaded, when persons are named, where more is given by the verdict than is laid in the declaration, &c. This may be done either in criminal or civil cases.

**ARRRESTIANDIS BONIS**, &c. a writ that lies for one whose cattle or goods are taken by another, who is likely to carry them away before the contest is decided.

**ARRRESTIO FACIO SUPR BONIS**, &c. a writ brought by a denizen against the goods of aliens found within this kingdom, as a recompence for goods taken from him in a foreign country.

**ARRRESTIMENT**, in Scots law, signifies the securing of a criminal till trial, or till he find caution to stand trial, in what are called *ludible crimes*.

**ARRHABONARI**, a sect of Christians, who held that the churchist is neither the real flesh or blood of Christ, nor yet the sign of them, but only the pledge or earnest thereof.

**ARRHIZNICUM**. See **ARSENICUM**.

**ARRIAN**. The most eminent of this name was a philosopher of Nicomedia, priest of Ceres and Proserpine, and disciple of Epicurus, called another Xenophon from the elegance and sweetness of his diction, and distinguished for his acquaintance with military and political life. He wrote seven books of Alexander's expedition, the Periplos of the Luxuriant Red Sea, four books on the dissertations of Iphiclus, besides an account of the Alani, Bithynians, and Parthians. He flourished about the 140th year of Christ, and was rewarded with the consulship and government of Cappadocia by M. Antoninus. — A poet who wrote in epic poem in twenty four books on Alexander, also another poem on Attalus, king of Pergamus. He likewise translated Virgil's *Georgics* into Greek verse.

**ARRISION** *v* (*arriso*, Lat.) A smiling upon.

**ARRIVAL** *s* (from *arrive*) The act of coming to any place, and, figuratively, the attainment of any purpose (*Waller*).

**ARRIVANCE** *s* (from *arrive*) Company conveyed, not used (*Sakspeare*).

**To ARRIVE** *v* *n* (*arriver* 1 r) 1 To come to any place by water (*Dryden*). 2 To reach any place by travelling (*Sidney*). 3 To

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reach any point (*Locke*). 4 To gain any thing (*Addison*). 5 To happen (*Waller*).

**ARRIUS**, a friend of Cicero, whose sumptuous feast Horat describes, 2 sat.

**ARRIUS**, and **ARIUS**, a philosopher of Alexandria, who so ingratiated himself with Augustus, after the battle of Actium, that the conqueror declared the people of Alexandria owed the preservation of their city to these three causes, because Alexander was their founder, because of the beauty of the situation, and because Arrius was a native of the place.

**ARRODE** *v* *a* To gnaw or nibble.

**ARROE**, a small island of the Baltic sea, belonging to Denmark. Lat 55 10 N. Lon 10 20 E.

**ARROGANCE**, or **ARROGANCY** (from *arrogantia*) The act or quality of taking much upon oneself. According to Dr Cogin, arrogance indicates itself by some particular claims to precedence, or marks of distinction and respect from those whom pride considers its inferiors in station and character, or, by impudent pretensions to an equality with superiors.

**ARROGANT** *a* (*arrogans* 1 r) Haughty, proud (*Temple*).

**ARROGANTLY** *ad* (from *arrogant*) In an arrogant manner (*Dryden*).

**ARROGANTLESS** *s* (from *arrogant*) Arrogance.

**To ARROGATE** *v* *a* (*arrogare*, Lat.) To claim solely, to exhibit unjust claims (*Rail*). **ARROGATION** *s* (from *arrogare* etc.) A claiming in a proud unjust manner.

**ARRONDEE**, in heraldry, a cross, the arms of which are composed of sections of a circle not opposite to each other, so as to make the arm bulge out thicker in one part than in other, but both the sections of each arm lie the same way, so that the arm is every where of an equal thickness, and all of them terminate at the edges of the escutcheon, like the plain cross.

**ARROSION** *s* (from *arrosus*, Lat.) A watering.

**ARROW**, a river of Worcesterhire and Warwickshire, which runs into the Avon, near Biliord Grange.

**ARROW** *s* (a *ephe*, Græc) The pointed weapon which is shot from a bow (*Hayward*).

**ARROW**, in fortification, is a work placed at the salient angles of the glacis, and consists of two parapets each forty toises long. The work has a communication with the covert-way of about 24 or 30 feet broad, called *caponier*, and a ditch before it of 5 or 6 toises.

*Fire Arrows* were first used in war by the Persians under Xerxes, who, when encamped on the hill opposite the citadel of Athens, commenced their attack by shooting against the barricade of wood, which the oracle had declared invincible, arrows wrapped in tow, and set fire to. The warriors of the middle ages frequently fixed phials of quick lime, or other combustible matter, to their arrow-heads, and shot them from the bow, and in sea-fights they were found particularly effective.



## A R S

**ARROWAUKS**, in geography, a name given to the ancient natives of Hispaniola, Cuba, Jamaica, Portorico, and Trinidad.

**ARROWHEAD** *s* (from *arrow* and *head*) A water plant, whose leaves resemble the head of an arrow (See *SAGITTARIA*) The roots of this plant, *sagittaria sagittifolia* of Linnaeus, are said to be esculent, but it must be in times of very great scarcity.

**ARROW-MADED GRASS** See *TRICLOCHIN*.

**ARROW-ROOT** (Indian) See *MARANTA*.

**ARROWS** in surveying, small sticks shod with iron, to stick into the ground at the end of the chain.

**ARROWY** *a* (from *arrow*) Consisting of arrows (*Hilton*).

**ARUCIATIS**, in ancient geography, a town of Spain, in Bætica, near the mountains.

**ARSACIDA**, in ancient history a denomination given to the kings of Parthia beginning with Arsaces I., the founder of the Parthian monarchy and terminating with Artabanus who was put to death by order of Artaxerxes after the Parthians were subdued by the Persians.

**ARSI** *s* (εαρς Six) The buttocks, or hind part of an animal.

**ARSI TOOT** *s* A kind of water fowl.

**ARSI-SMART** *s* (*persicaria*, L.) A plant. See *POLYGONUM*.

**ARSENIAL** *s* (*arsenale*, It.) A repository, of things requisite to war, a magazine of military stores (*Adisson*) The principal arsenal in London is that at Woolwich, formerly known by the name of the Warren, where there are immense quantities of great guns, mortars, bombs, balls, powder, and other military stores, and where are likewise foundries for casting guns with extensive machinery for boring, turning, and all other operation connected with the construction of artillery and their carriages.

**ARSENIALS**, neutral salts formed by the combination of arsenical acid with alkalies, earths and metals. See them particularized in the next article.

**ARSENICUM** In oryctology, a genus of the class metals. Bluish white, soon becoming black, and filling to powder in the air, soft, extremely brittle, specific gravity 8.310, subliming without melting in a moderate heat in a white powder, emitting a strong smell resembling garlic, its sublimed oxyd giving an acrid taste to water, and turning vegetable blue-red, when dissolved in muriatic acid, and a watery solution of sulphurated hydrogen poured on it, precipitating a fine yellow powder. It contains seven species.

1 A nativum. Nude or native arsenic, of which there are three varieties.

a Uncombined with metallic lustre, separating into spherical incrustations.

β With micaceous particles.

γ Friable and porous.

Found in Great Britain, various parts of Ger-

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many, Norway, Saxony, &c accompanying spar, baryte, or feldspar, massive, rarely disseminated, often composed of hemispheric layers, corroded, branched, perforated, botryoidal, or stalactitic, colour lead-grey, but its surface soon tarnishing and becoming black by exposure to the air, streak blueish-grey, powder dull and blackish, sometimes a little sonorous when struck against a hard body, and so soft as to be easily cut with a knife. Before the blow-pipe it emits a white smoke, diffusing its peculiar and highly poisonous vapours to a great distance, burning with a blue flame and gradually vanishing, depositing a white oxyd in the form of a powder, specific gravity 5.670 to 5.729, always alloyed with some iron, and often contains some cobalt, bismuth, silver, and sometimes a little gold.

2 A calciforme. White arsenic. White oxyd of arsenic. White, soluble in eighty times its weight of water. It is found in a loose dust or mealy powder, in a state of crystallization, or in an indurated state combined with earth, in various parts of Great Britain, Germany, Hungary, Saxony, Bohemia, &c. Colour white or grey, with often a tinge of red, yellow, green, or black before the blow-pipe it sublimates, but does not inflame, and tinge borax green. Specific gravity 3.700.

3 A impigmentum. Orpiment. Yellow arsenic. Ponderous, yellow, curved, or undulately foliated of a waxy internal lustre, evaporating almost entirely before the blow-pipe. Found in Great Britain, Hungary, Germany, Turkey, &c, massive, disseminated, or in small imperfect crystals, colour, various shades of yellow, with a considerable waxy lustre, and some transparency, streak orange-yellow, not metallic, texture foliated, with the plates mostly curved or undulated, rarely striate, a little flexible, but not elastic, effervesces with hot nitric acid, burns with a blueish flame, and before the blow-pipe evaporates, leaving behind a small portion of earth. Specific gravity 3.045 to 3.61.

4 A sulfurat. Realgar. Ruby arsenic. Reddish. Somewhat ponderous, red, with an orange yellow streak, in straight foliations, melting easily before the blow-pipe, burning with a blue flame and white arsenical vapours. Found in Sicily, Naples, Hungary, Bohemia, China, Japan, &c, massive, disseminated, superficial, or crystallized in small acute angled, quadrangular, or acicular prisms, colour auro-red, ruby, scarlet, crimson or blood-red, often variegated with yellow traces, texture lamellar, with the foliations a little flexible, and so soft as to be cut with a knife, and frequently exhibits a brilliant lustre, streak yellowish red, powder scarlet, in nitric acid it loses its colour. Specific gravity 3.338.

5 A sulphuratum. Marcasite. White mundic. White pyrite. Pyritical arsenical ore. Hard bluish-grey with metallic lustre before the blow-pipe emitting white arsenical vapours and blue sulphureous flames. Found in various parts of Great Britain, Germany, Sweden, Bohemia, Saxony, &c in irregular

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masses, disseminated, investing or crystallized in cubes or four-sided prisms, specific gravity 6.522

**6 A albicans** Misspickel Marcasite Of a steel-white colour and lustre, hard, emitting white arsenical vapours before the blow-pipe, but no sulphureous flame or vapour. Found in Cornwall, near Dublin, in Bohemia, Silesia, Saxony, &c generally disseminated among tin ores in granulations, or crystallized in four-sided double pyramids, or four-sided quadrangular prisms. colour sometimes silvery, grey, or yellowish, or iridescently variegated when tarnished. texture compact, sometimes a little splintery, with the surface marked with decussite grooves or black ramifications, effervesces with nitric acid without heat, and yields an arsenical smell when rubbed. It consists of arsenic alloyed with a considerable quantity of iron, but little or no sulphur, specific gravity from 5.753 to 6.522

**7 A argenteum** Argenteous arsenic Of a silvery lustre and very fine granular texture, emitting arsenical vapours before the blow pipe, and when fused with lead leaving a silver bead. Found in the mines of Saxony, Bohemia, Germany, and Spain, massive, disseminated, or acicular, colour nearly that of the last, but brighter and more permanent. burns with a white flame, and leaves a reddish residuum by solution in nitro-muriatic acid the silver will be precipitated. It consists of arsenic, sulphur, iron, and from 1 to 10 or 12 per cent of silver. specific gravity 4.087

In the assay and analysis of arsenical ores, the following method by Mr Chevenix is esteemed preferable to any other. Reduce the ore to a very fine powder, and digest it in nitric acid sufficient to acidify and take up the whole of the arsenic, pour off the clear liquor, and boil on the residue some distilled water filtré, and add the water to the nitrous solution then neutralize the excess of acid by potash, taking care, however, not to have an excess of alkali, and add nitrate of lead as long as any precipitate takes place wash the precipitate in cold water, dry, and weigh it. As the arsenical ores often contain sulphur, it is possible that the arseniat of lead thus procured may be mixed with a little sulphat of lead to decide this, digest the powder in some warm dilute muriatic acid, and the arseniat of lead will be dissolved, leaving the sulphat behind.

The arsenic of commerce is not prepared from the direct reduction of the proper ores of this metal, but is obtained in Saxony by roasting the cobalt ores in the manufacture of zaffre. These ores consist principally of arsenic cobalt, iron, and a little sulphur, the first and last ingredients are easily separated by roasting, which is performed, not in the open air, but in an oven the flue of which runs horizontally to a considerable distance before it bends upwards. The arsenic and sulphur, when liberated, are deposited for the most part in the horizontal flue. In this state it is called

*Crude arsenic*, or *flowers of arsenic*, and the shape it assumes is that of a grayish meal,

streaked with yellow, which is occasioned by the sulphur uniting with parts of the arsenic, and composing orpiment. From the crude arsenic the

*White arsenic* of commerce is prepared, by mixing the crude with potash or lime, and re-subliming. The sulphur and other impurities are thus combined with the alkali, and the white oxide is driven over into a heated receiver, where it melts into a heavy, colourless, transparent glass by exposure to the air for a short time this glass becomes opaque, and resembles in its fracture the finest white china, it is in this state that the white arsenic of commerce is sold in the shops, and kept in our laboratories, and as it is then in oxide of the metal, approaching very nearly to a state of purity, it is not difficult, by separating its oxygen, to reduce it into

*Pure metallic arsenic* For this purpose the white arsenic is mixed with any of the vegetable or animal expressed oils, till it becomes of the consistence of very soft glazier's putty, and round or oblong pieces of the putty are dropped into a Florence flask, or earthen retort, so as not to adhere to the sides. It is then put into a sand bath, or over a gentle charcoal fire, and heated very gradually until it ceases to emit thick vapour. When the heat may be increased by degrees to obscure redness. Shortly after the vessel may be removed, and when cold broken the neck and upper part will contain a crystallized oxide of arsenic, below, a thick crust of metallic arsenic, and at the bottom some impurities, which must be laid aside. The other products are to be pulverized with half their weight of charcoal, and sublimed again as before, by which means the arsenic is rendered pure, and will be found to line the vessel in the form of a shining crust and crystals. For the safety of the operator, these processes should be performed under a chimney. The principal properties of pure arsenic beside those mentioned in the beginning of this article, are the following —

As it is not perceptibly soluble in water, and is easily tarnished by exposure to the air the best method of preserving it unaltered is to immerse it in water or alcohol. With carbon or hydrogen it does not combine, but the latter substance, in the state of gas, dissolves it. Oxygen unites with it by combustion, forming arsenical acid. With sulphur it may be readily united, forming either red lead or orpiment, according to the proportions of the ingredients, or the methods of uniting them. These substances are really sulphurets of arsenic, and their properties, with their mode of preparation, when not found native, may be found under their names. Arsenic combines also readily with phosphorus, forming phosphuret of arsenic, which is black and brilliant, but with azotic gas it has not been united. Muriatic acid attacks it not only if aided by heat, but, by distilling equal parts of orpiment and corrosive muriatic of mercury (corrosive sublimate) with a gentle heat, a blackish corrosive liquor is obtained, which is the sublimat-

ed muriatic acid of arsenic, or butter of arsenic. Arsenic combines with most metals, forming with them alloys, and rendering them more fusible and brittle, though such of them as were before very fusible, become refractory. It possesses also the singular property of destroying the magnetic virtue of iron, and of all other metals susceptible of it. The most useful alloys of arsenic are as follow—1 With platinum, which is formed by fusing that metal and the white oxide of arsenic together. By this means platinum, itself so untractable, may be wrought into the utensils required. The mixture, after fusion, is hammered as a red heat into bars, and the arsenic is gradually driven off. 2 With copper, which is formed by fusing the two metals together in a close crucible, their surface being covered with common salt, to prevent the arsenic from being oxidized by the air. This alloy is white and brittle, and when mixed with a little tin or bismuth is used for a variety of purposes in the arts, when it is known by the names of white copper or white tombac. 3 With iron, which is likewise done by fusion. This alloy, however, is often found native, and is then (as we have already observed) called mispickel. The other metals with which arsenic has been united, are gold, silver, tin, lead, nickel, zinc, antimony, and bismuth. It also forms an amalgam with mercury, by keeping them some hours over the fire, constantly agitating the mixture.

Arsenic is capable of combining with two different proportions of oxygen, by the first is formed the white oxide already described, or

*Arsenous acid*, as it is denominated by Fourcroy, on account of the many acid properties which it exhibits, by the second is produced

*Arsenic or arsenical acid*, which was discovered in 1775 by Scheele, who also made himself acquainted with its most remarkable properties. There are several methods of preparing this acid, but the following, by Bucholz, is considered as the best. Mix together in a crucible two parts of muriatic acid of the specific gravity 1.2, eight parts of white oxide of arsenic, and 24 parts of nitric acid of the specific gravity 1.25. Evaporate to dryness, and expose the dry mass to a slight-red heat. When first prepared, it exists in a concrete form or dry mass, of a white colour, which has very little taste, but on becoming fluid by deliquescence, or being dissolved in water, it acquires an excessively sour taste. It is as noxious as the white arsenic. Its component parts are about 65 of arsenic to 35 of oxygen, and its specific gravity is 3.391. It is very fixed in a strong heat it is converted into a glass, which attracts moisture from the air. Six parts of cold water dissolve it slowly, and two parts of boiling water almost instantly it remains in solution, however, if a considerable portion of that water be evaporated, even so much as to reduce it to a syrup a further evaporation causes it to deposit crystals. It is not affected by oxygen, or by exposure to the

air, the simple combustibles, viz sulphur, phosphorus, carbon, and hydrogen, decompose it by the assistance of heat, which will also enable several of the metals to decompose it. Combined with alkalis, earths, and several of the metallic oxyds, it forms that class of compound salts which are distinguished by the name of

*Arsenat of Potash*, formed by saturating the arsenic acid with potash, shoots into large, four-sided, columnar crystals, terminated by quadrilateral pyramids. It is of easy solution in water, permanent in the air, and melts in fire to a glassy substance. With excess of acid, the salt is called, by some,

*Super-arsenat of potash*, and was long known as the arsenical neutral salt of Macquer, by whom it was discovered, and who formed it by distilling in a retort equal parts of white oxide of arsenic and nitre. Scheele obtained it by adding arsenic acid to the arseniat of potash till the solution ceases to alter the colour of syrup of violets, and then evaporating till four-sided prismatic crystals are formed. This salt is soluble in water, and gives a red colour to vegetable blues.

*Arsenat of soda* is nearly similar to that of potash, and is produced in the same manner, by saturating acid with the acid.

*Arsenat of barytes* may be obtained by digesting the acid upon barytes, or, in crystals, by mixing a warm concentrated solution of acetate of barytes and arseniat of potash.

*Arsenat of magnesia* is formed by digestion, solution in a fresh quantity of acid, and evaporation.

*Arseniat of lime* is produced by pouring arsenic acid into lime-water.

*Arseniat of silver* is precipitated by dropping the acid into a solution of nitrat of silver, and that of mercury is produced in the same manner. The arsenic acid is also frequently combined with other metallic oxyds, and in consequence gives birth to other arseniats, as

*Arseniat of cobalt*, for which see COBAL-TUM.

*Arseniat of lead*, for which see PLUMBUM.

*Arseniat of nickel*, for which see NICCOLUM.

Arsenic, and its various preparations, are the most active of all poisons; nevertheless it is a very valuable article in the materia medica, and is very generally used as a tonic in inter-nutrient and hysterical complaints. The following is Dr Fowler's method of preparing it for internal use. Take of powdered arsenic and prepared kali, each 64 grains, boil them gently in a Florentine flask, or other glass vessel, with half a pound of distilled water, until the arsenic is dissolved, to this solution, when cold, add half an ounce of compound spirit of lavender, and as much water as will make the whole equal to a pint, or fifteen ounces and half in weight. The dose of this solution is as follows—From two drams to four, gut 1j, or 1ij, to v; from five to ten, gut v to 1j; from eight to twelve, gut 1j to x, from thirteen to eighteen, gut x to xij, from eighteen

and upwards, gut. xij These doses may be repeated once in eight or twelve hours, diluted with thick gruel or barley-water Arsenic has long been the favourite escharotic amongst quacks who pretend to cure cancer, and it enters into the celebrated Plunket's caustic The following plan should be pursued when arsenic has been swallowed in a quantity sufficient to endanger the life of the person — A vomit of white or blue vitriol should be exhibited immediately, and large quantities of water, in which the hepar sulphuris is dissolved, swallowed The stomach having been thus emptied, a mixture containing the hepar sulphuris, so as to have about a scruple to a dose, should be exhibited frequently, alternating with milk, butter, or castor oil

**ARSENIATS**, the principal of which are as follow, Macquer discovered this genus of salts, but their nature and composition were first pointed out by Scheele They are known by being precipitated from their solutions, in the form of a yellow powder, by water, holding sulphurated hydrogen gas in solution, or by hydrosulphuret of ammonia

**Arseniat of ammonia** is produced by saturating liquid ammonia with arsenic acid, and evaporating the mixture until a salt is yielded in rhomboidal crystals, which give a green colour to syrup of violets

**Arseniat of copper**, a mineral substance, being an ore of that metal in which the arsenic acid is found in a state of natural combination with it There are several species and varieties of this ore, containing different proportions of the ingredients It is found in the copper mines of Cornwall, and is almost peculiar to England See also the article **COPPER**

**Arseniat of iron** is also found in one of the mines which contain the preceding ore It is sometimes mixed with a small portion of copper, and in this state of double combination of the acid with both metals, it has been called **arsenical copper ore**, or more recently and correctly, **cupreous arseniat of iron** (See **FERRUM**) These arseniats have been ably examined by the count de Hournon, and by Mr Chenevix, the former of whom, by an arrangement deduced from the principles of crystallography, and the latter by an accurate analysis, have satisfactorily ascertained their nature and composition The ingenious papers of these gentlemen are inserted in the *Philosophical Transactions* for 1801, and may be found in Tillich's *Philosophical Magazine*, vol XII; or in Nicholson's *Journal*, new series

**ARSENICAL a** (from *arsenick*) Containing arsenick (*Woodward*)

**ARSENITES**, a term given by Fourcroy to the combinations of white oxide of arsenic, or arsenious acid, with alkalies and earths They were formerly called *livers of arsenic*

**ARSINOE** is a name given to several places in Egypt, Cyprus, &c The word is a compound of *Ar* = water, *Sin* = sons, and most places so called are famous for some fountain

**ARIS** and **THESIS** (from the Greek), are terms appropriated to prosody and melody

**ARIS** signifies the elevation of the hand, or that part of the bar, or measure, at which it is raised in beating time **Thesis**, on the contrary, implies the fall of the hand, or that part of the bar at which it falls **Thesis** implies the emphatic or constituted part of the bar, and **arisis** the weak, or unaccented part

**ARSON**, in English law, is the malicious and wilful burning of the house or out-house of another man; which is felony at common law This is an offence of very great malignity, and much more pernicious to the public than simple theft, because, first, it is an offence against that right of habitation which is secured by the law of nature as well as by the laws of society next, because of the terror and confusion that necessarily attend it and, lastly, because in simple theft the thing stolen only changes its master, but still remains *in esse* for the benefit of the public, whereas, by burning, the very substance is absolutely destroyed It is also frequently more destructive than murder itself, of which too it is often the cause

**ARSUF**, a sea-port town of Palestine, in the Mediterranean, six miles north-east from Joppa

**ARSURA**, an ancient custom, a term used for the melting of gold and silver, either to refine them, or to examine their value

**ARSURA** is likewise sometimes used to denote the disease called *crystipelas*

**ART** s (*art*, Fr *ars*, Lat ) 1 The power of doing something not taught by nature and instinct (*Pope*) 2 A science as, the liberal arts (*B Jonson*) 3 A trade (*Boyle*) 4 Artfulness, skill, dexterity (*Shaks*) 5 Cunning (*Shaks*) 6 Speculation (*Shaks*)

The above meanings are attached to the word *art*, in Johnson's dictionary abridged as some of these, however, are of great importance, we must enlarge upon them, as below

**Art** is defined to be a habit of the mind prescribing rules for the due production of certain effects, or the introducing the changes of bodies from some fore-knowledge and design in a person endued with a principle or faculty of acting The word *art* is derived from *aper*, utility, profit; and is found in that sense in *Æschylus* According to lord Bacon, it is a proper disposition of the things of nature by human thought and experience, so as to make them answer the designs and uses of mankind

Nature, according to lord Bacon, is sometimes free, and at her own disposal, and then she manifests herself in a regular order, as we see in the heavens, plants, animals, &c Sometimes she is irregular and disorderly, either through some uncommon accident, or depravation in matter, when the resistance of some impediment perverts her from her course, as in the production of monsters At other times she is subdued and fashioned by human industry, and made to serve the several purposes of mankind This last is what we call *art*, in which sense, art stands opposed to nature Hence the knowledge of nature may be divided into the history of generation, of preter-

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generation, and of arts! The first considers nature at liberty, the second, her errors, and the third, her restraints.

ART is also used for science, or knowledge reduced into practice. Several of the school-men hold logic and ethics to be arts; inasmuch as they do not terminate in mere theory, but tend to practice. In this sense some branches of the mathematics also are arts; others, matters of doctrine, or science. Statics is, wholly scientific, as it comprehends the mere contemplation of equilibrium, mechanics, on the contrary, is an art, as it reduces the doctrine of statics into practice.

ART is more certain system and inventions or duly observed, make the things a man undertakes succeed, and render them advantageous and agreeable. In this sense, art is opposed to science, which is a collection of speculative principles and conclusions. According to the foregoing definition, arts may be divided into active and effective: such as leave no external effect after their operation, as dancing, fiddling, &c are called active or practical arts, those which do leave an effect behind them, as painting, &c are called effective arts. Farther, with respect to their scope and object, they may be divided into human, as medicine, and divine, as theology.

ARTS (*human*), again, may be subdivided into civil, as law, politics, &c, military, as fortification, &c, physical, as agriculture, chemistry, anatomy, &c, metaphysical, as logic, pure mathematics, &c, philological, as grammar, criticism, &c, mercantile, to which belong the mechanical arts and manufactures. See each in its place.

Arts are more properly divided into liberal and mechanical.

ARTS (*liberal*), are those that are noble, and ingenious, or which are worthy of being cultivated without any immediate regard to the lucre arising from them. Such are poetry, music, painting, grammar, rhetoric, the military art, architecture, and navigation.

ARTS (*mechanical*), are those, wherein the hand and body are more concerned than the mind, and which are chiefly cultivated for the sake of the profit attending them. Of which kind are most of those which furnish us with the necessaries of life, and are popularly known by the name of trades. Such are weaving, turnery, brewing, masonry, clock-making, carpentry, joinery, foundry, printing, &c.

The mechanical arts take their denomination from *μηχανή*, machine, as being all practised by means of some machine or instrument.

With the liberal arts it is otherwise, there being several of them which may be learnt and practised without any instrument at all as logic, eloquence, medicine properly so called, &c.

The arts which relate to the sight and hearing, Lord Bacon observes, are reputed liberal, beyond those which regard the other senses, and are chiefly employed in matters of luxury

these are usually called the fine arts; such are poetry, painting, sculpture, music, gardening, and architecture.

It has been well noted by philosophers, that, during the rise and growth of states, the military arts chiefly flourish; when arrived at their height, the liberal arts; and when in a declining state, the voluptuary arts.

There are also divers particular arts, as the art of memory, the art of deciphering, the art of swimming, art of diving, &c.

ART and SCIENCE are, indeed, words of familiar use, and great significance; but, we fear, little understood. Philosophers have long

secure notion for another. Their attempts have usually terminated in some abstracted definition, which rather casts obscurity than light on the subject, and expresses very little of the essence and obvious phenomena thereof. We have always been pleased with the observations on this subject given in Mr Chambers's excellent Preface to his Cyclopædia, and have, therefore, extracted some of them for the gratification of our readers.

To science, says this profound thinker, seem to belong such things as men may discover by the use of sense and reasoning, whatever the mind descries in virtue of that faculty whereby we perceive things, and their relations, is matter of science. Such are the laws of nature, the affections of bodies, the rules and criterions of right and wrong, truth and error, the properties of lines and numbers, &c. Science, in effect, is the result of reason and sense, in their general or natural state, as imparted to all men, and not modified, or circumstantiated, by any thing peculiar to the make of a man's mind, the objects he has been conversant among, or the ideas he has present to him. In fine, science is no other than a series of deductions or conclusions, which every person endued with those faculties may, with a proper degree of attention, see and draw; and a science, i. e. a formed science, is no more than a system of such conclusions, relating to some one subject, orderly and artfully laid down in words. Thus a person who has all the ideas expressed in Euclid's definitions, and sees the immediate connexion of those in his axioms (which no man acquainted with his language can be supposed without), may be said to have it in his power, with attention and industry, to form all the theorems and problems that follow, he has nothing to do but to range those ideas orderly in his mind, compare them together, one by one, in all their changes, and put down the immediate relations observed in the comparison, i. e. their parity, imparity, &c. And after the relations of each to each are thus got, which make a kind of primary propositions, to proceed to combine them, and take down the relation resulting from a comparison of the several combinations. By such means, without any other helps than penetration and perseverance,

# ARTS.

might be made out an infinite number of ph-  
s; possibly more than twenty; one not as-  
sing a new relation, i. e. a new propo-  
tion, resulting from every new combination.

To ART, on the other hand, belong such  
things as mere reason could not have attained  
to; things which lie out of the direct path of  
deduction, and which require a peculiar cast  
of turn of mind to use or arrive at. A man  
judges out these the results of particular or  
imaginal reason, in opposition to the former,  
but that such a denomination would be thought  
philosophical. It may, perhaps, be more  
just to consider reason, here, as modified or  
fractured with something in the complexion,  
humour, or manner of thinking, of the person,  
or as restrained and diverted out of its proper  
course, by some views or notions peculiar to  
him. The difference between the two may  
be illustrated by that between wit and humour,  
the former whereof is a general faculty of ex-  
citing agreeable and surprising pictures in the  
imagination; and the latter a particular one;  
the former is pure and absolute in its kind;  
the latter unged with something foreign and  
complexional.

An Art and a Science, therefore, only seem  
to differ as less and more pure: a science is a  
system of deductions made by reason alone,  
undetermined by any thing foreign or extrinsic  
to itself; an art, on the contrary, requires a  
number of data, and postulates, to be furnished  
from without, and never goes any length,  
without, at every turn, needing new ones. It  
is, in one sense, the knowledge and perception  
of these data that constitute the art: the rest,  
that is, the doctrinal part, is of the nature of  
science; which attentive reason alone will  
attain. An art, in this light, appears to be a  
portion of science, or general knowledge, con-  
sidered, not in itself as science, but with re-  
striction to its circumstances or appendages. In  
a science, the mind looks directly backwards  
and forwards to the premises and conclusions;  
in an art we also look laterally to the concom-  
itant circumstances. A science, in effect,  
is that to an art, which a stream running in a  
direct channel, without regard to any thing  
but its own progress, is to the same stream  
when it is of its proper course, and disposed  
as rivers, jets, cisterns, ponds, &c.

In the case the progress of the stream is not  
aid with regard to itself, but only as it  
is the work, every one of which indi-  
cates the course of the stream, and leads it out  
of it.

It is easy to trace the progress of  
an art, from its rise to its issue, in regard  
consequently; but a man ever as-  
sisted with this will not be able to  
of the latter, in regard to its progress  
on the former, without, but of

These are some of the different characters,  
or qualities, of art and science; but there is  
a difference between them prior to any of these,  
and which these are only consequences.  
The first of them all lies higher in the prin-  
ciple of action, or operation, above specified;

namely, as the mind is either active or passive  
in respect of these. With regard to this, those  
things may be said to belong to science, which  
are only seen, or passive; which flow from the  
nature and constitution of things, by the sole  
agency of the author thereof; subservient only  
to his general purposes; exclusive of any im-  
mediate agency, or intervention of ours. And,  
on the contrary, those things belong to art,  
wherein such sciences or perceptions is farther  
modified, and applied by us to particular pur-  
poses and occasions of our own. From hence  
arise the several differences abovementioned  
for the matters of art are only personal, as they  
are according to the measure of the artist's na-  
tural faculties, in respect of quantity and de-  
gree; and to the complexion and cast of his  
moral faculties, in respect of their quality.

The perception, even of matters of art, is of  
the nature of science, so that thus far the two  
agree, and their differences only commence  
from the superinducing of a further modifica-  
tion in the matter of such perception, and the  
giving it a new direction to some particular  
end. By means whereof it becomes invested  
with a new set of conditions, and circum-  
stances wholly personal, as being all framed  
and adapted to the particular view and aim of  
the artist, and conducted according to his par-  
ticular degree of knowledge and address, which  
is the effect of a particular set of objects, and a  
particular organism of body. In a word, in  
art there is a moral view or motive, super-  
added to the natural science or perception  
which motive is the proper principle, or pri-  
mum mobile, of art: perception is its matter,  
and some member of the body is its organ, or  
instrument. And from such new principle,  
&c. arise a new set of secondary perceptions  
analogous to the natural and primary ones.  
The whole, therefore, ends in this, that sci-  
ence arises from a natural principle, art from  
a moral one, or even, as moral matters are  
also, in one sense, natural, science may be said  
to be of divine original, art of human.

ARTS (Progress of the) In all countries  
where the people are barbarous and illiterate,  
the progress of arts is extremely slow. It is  
vouched by an old French poem, that the vir-  
tues of the loadstones were known in France  
before anno 1780. The mariner's compass  
was exhibited at Venice anno 1260, by Paulus  
Venetus, as his own invention. John Goya  
of Amalphi was the first who, many years af-  
terward, used it in navigation; and also passed  
for being the inventor. Though it was used  
in China for navigation long before it was  
known in Europe, yet to this day it is not so  
perfect as in Europe. Instead of suspending  
it in order to make it not freely, it is placed  
upon a bed of sand, by which every motion of  
the ship disturbs its operation. Hand-mills,  
termed querns, were early used for grinding  
corn; and when corn came to be raised in  
greater quantity, horse-mills succeeded. Wa-  
ter-mills for grinding corn are described by  
Vitruvius. Wind-mills were known in Greece  
and in Arabia as early as the seventh century,



and yet no mention is made of them in Italy till the fourteenth. That they were not known in England in the reign of Henry VIII. appears from a household book of an earl of Northumberland, contemporary with that king, stating an allowance for three mill-horses, "two to draw in the mill, and one to carry stuff to the mill and fro." Water-mills for corn most in England have been of a later date. The ancients had mirror-glasses, and employed glass to imitate crystal vases and goblets; yet they never thought of using it in windows. In the 13th century, the Venetians were the only people who had the art of making crystal glass for mirrors. A clock that strikes the hours was unknown in Europe till the end of the 12th century. And hence the custom of employing men to proclaim the hours during night, which to this day continues in Germany, Flanders, and England. Galileo was the first who conceived an idea that a pendulum might be useful for measuring time, and Huygens was the first who put the idea in execution, by making a pendulum clock. Hooke, in the year 1660, invented a spiral spring for a watch, though a watch was far from being a new invention. Paper was made no earlier than the 14th century; and the invention of printing was a century later. Silk manufactures were long established in Greece before silk-worms were introduced there. The manufacturers were provided with raw silk from Persia, but that commerce being frequently interrupted by war, two monks, in the reign of Justinian, brought eggs of the silk-worm from Hindostan, and taught their countrymen the method of managing them.—The art of reading made a very slow progress. To encourage that art in England, the capital punishment for murder was remitted if the criminal could but read, which in law-language is termed benefit of clergy. One would imagine that the art must have made a very rapid progress when so greatly favoured; but there is a signal proof of the contrary, for so small an edition of the Bible as 600 copies, translated into English in the reign of Henry VIII. was not wholly sold off in three years. The people of England must have been profoundly ignorant in queen Elizabeth's time, when a forged clause added to the 20th article of the English creed passed unnoticed till about forty years ago.

The discoveries of the Portuguese on the west coast of Africa is a remarkable instance of the slow progress of arts. In the beginning of the 15th century, they were totally ignorant of that coast beyond cape Non, 28 deg. north latitude. In 1410 the celebrated prince Henry of Portugal fitted out a fleet for discoveries, which proceeded along the coast to cape Bojadore in 26 deg. but had not courage to double it. In 1418 Tristan Vaz discovered the island Porto Santo; and the year after, the island Madeira was discovered. In 1439 a Portuguese captain doubled cape Bojadore, and the next year the Portuguese reached cape Blanco, lat 20. deg. In 1446 Nuna Tristan doubled

cape Verde, lat. 14. 40. In 1448 don Goncalo Vaillo took possession of the Azores. In 1480 the latitude of cape Verde were discovered for don Henry. In 1483 Pedro d'Escovar discovered the island St. Thomas and Prince's island. In 1484 Diego Cam discovered the kingdom of Congo. In 1486 Bartholomew Diaz, employed by John II. of Portugal, doubled the Cape of Good Hope, which he called Cabo Tormentoso, from the tempestuous weather he found in the passage.

The circumstances which tend most to accelerate the progress of the arts, are, the exertion of national spirit upon any particular art, which promotes activity in the prosecution of other arts;—the patronage of the opulent and the noble;—the rousing a people out of a torpid state by the occurrence of an important series of events;—emulation between neighbouring nations;—and by no means least among these, a struggle for liberty, the resisting a powerful invader, &c. Thus Greece divided into small states, frequently at war with each other, advanced literature and the fine arts to unrivalled perfection. The Corsicans, while engaged in a perilous war for defence of their liberties, exerted a vigorous national spirit: they founded a university for arts and sciences, a public library, and a public bank. After a long stupor during the dark ages, arts and literature revived among the turbulent states of Italy. The Royal Society in London, and the Academy of Sciences in Paris, were both of them instituted after civil wars that had animated the people and roused their activity.

*Useful Arts* will never be neglected in a country where there is any police; for every man finds his account in them. Fine arts are more precarious. They are not relished but by persons of taste, who are rare, and such as can spare great sums for supporting them, are still more rare. For that reason they will never flourish in any country, unless patronised by the sovereign, or by men of power and opulence. They merit such patronage, as one of the springs of government; and a capital spring they make, by multiplying amusements, and humanizing manners, upon which account they have always been encouraged by good princes.

*General Theory of the Polite Arts.* The science of the polite arts consists in expression. The end of all these arts is pleasure, whereas the end of the sciences is instruction and utility. Some of the polite arts indeed, as eloquence, poetry, and architecture, are frequently applied to objects that are useful, or extended in matters that are instructive, as we shall shew more particularly in their proper place; but in these cases, though the ground-work belongs to those sciences which employ the understanding, yet the expression arises from the inventive faculty. It is a picture that is designed by *Misericordia*, to which the colours add the colouring; and the *Garçon* the frame. This union forms therefore the perfection of the art, according to that sententious and well-



down, *poet* of *Homer*: *On* to *the* *poet*,  
*was*, *the* *poet*, *the* *poet*.

Under the denomination, therefore, of *Poetry*, we comprehend, 1. *Epic*; 2. *Tragedy*; 3. *Music*; 4. *Painting*; 5. *Sculpture*; 6. *Graving*; 7. *Architecture*; 8. *Dance*; 9. *Dancing*. Particular descriptions of these arts are given under their respective names. This branch of the present article is intended as a general introduction to them.

There is one very essential reflection, which it appears to us proper to make in the first place, on the polite arts in general. All the rules in the world are not sufficient to make a great poet, an able orator, or an excellent artist; because the quality, necessary to form them, depends on the natural disposition, the fire of genius, which no human art can confer, but which is the pure gift of Heaven. The rules, however, will prevent a map from being a bad artist, a dull orator, or a wretched poet, seeing they are the reflections of the greatest masters in those arts, and that they point out the spots which the artist should shun in the exercise of his talents. They are of use, moreover, in facilitating his labours, and in directing him to arrive by the shortest and easiest road to perfection. They refine, strengthen, and confirm his taste. Nature, abandoned to herself, has constantly something wild and savage. Art, founded on just and sagacious rules, gives her elegance, dignity, and polish, and it is impossible to sacrifice properly to the graces, without knowing the impetuosity that is pleasing to them.

Beauty is the object of all the polite arts. It is not however so easy, as it may seem, to give a clear and determinate idea of what we precisely mean by that term. Many able writers, who have treated expressly on the subject, have shown that they were totally ignorant of what it was. It is one of those expressions that we comprehend immediately, that present us with a clear and precise idea, that leave a distinct impression on our minds, when it is strongly written or pronounced; but which philosophers envelope in darkness, when they attempt to elucidate it by definitions and demonstrations, and the more, as mankind have different ideas of beauty, their opinions and tastes being as various as their understandings and imaginations. We may say, however, in general, that beauty results from the various proportions of which any object is susceptible, and which it actually possesses; and that the proportions which produce beauty consist principally in the agreeable and delightful proportions which are found, 1. Between the several parts of the same object; 2. Between each part and the whole together; 3. Between the parts and the eye or senses of the object to which they belong. *Clarity*, or *transparency*, is also beauty of the mind to which beauty is applied. *Clear*, *discreet*, or rather the *simplest* reflection of the mind formed by art, is to guide the genius in observing, examining, and producing that which is beautiful

of every kind. From whence it follows, that the general theory of the polite arts is nothing more than the knowledge of what they contain that is truly beautiful and agreeable; and it is this knowledge, this theory, which modern philosophers call by the Latin name of *aesthetics*.

It should be constantly remembered, that the essence of the polite arts consists in expression. This expression lies sometimes in the words, and sometimes in the pen, sometimes in sounds and their harmony, and at others in corporeal attitudes, sometimes in the pencil or in the chisel, and at others in the graver, sometimes in a proper disposition or judicious employment of the mechanic arts, and at others merely in their manner of acting. From whence arise those arts that we have mentioned, and which are described in their order.

The general theory of the polite arts, or *aesthetics*, necessarily supposes, therefore, certain rules; but these general rules are of no great number. The first is, that whoever would devote himself to the polite arts, should above all things consult his genius, divest himself of all self-love; and examine if he be a true son of Apollo, and cherished by the Muses for

In vain, rash author, dost thou strive to climb,

By lofty verse, Parnassus' height sublime,  
 If Heaven do not by secret powers inspire,  
 Or if thy natal star dart not poetic fire.

This precept, with regard to poetry in particular, is applicable to all the polite arts in general, for their most happy success is founded on imagination. By this term we understand, in general, a faculty of the mind, a particular genius, a lively invention, a certain subtle spirit, which gives a facility in discovering something new. But it is necessary also to prescribe just bounds to this term new, which must not be here taken in an absolute sense. Solomon wisely remarks, that, even in his time, there was nothing new under the sun. In fact, all that exists, and all that is capable of being discovered in the known world, has already been discovered. The fine arts in their imitations of nature, in their expressions, can borrow images, figures, comparisons from those things only that exist and are known. As there have been, from the beginning of the world to our days, millions of authors in each of the polite arts, almost all the possible combinations of the various subjects have been produced by their lively imaginations; and when we hear the ignorant part of mankind talk of a work of wit or of art that is entirely new, that offers ideas which were before utterly unknown, that had never entered into the brain of any other man, we should refer such assertions to the class of popular errors; and reflect on those stories we everyday hear of certain empirics, who pretend to be alone possessed of marvellous methods of cure by means of simples; as if there were any plant, any stalk of grass that grows in our world, that can have escaped the researches of

botanist. But the novelty, of which we have speak, consists in the frequent use of combinations of all the various objects of nature that are new, happy, and agreeable, and yet have existed, and which appear even to be inexhaustible, and of this we judge the artist makes of his own discovery, which he turns to his advantage by a judicious application. Invention therefore supplies an inexhaustible fund of preliminary ideas, such as is capable of furnishing ideas and images, to form new combinations. But there is no art by which invention itself can be produced, for that, as we have already said, is the gift of Heaven; and it is an endowment which we cannot even make use of whenever we please. We would rather say, therefore, that invention consists in producing, in works of genius, that which is unexpected; an object, a harmony, a perfection, a thought, an expression, of which we had no idea, that we could not foresee, nor hope to find, where the artist has so happily placed it, and where we perceive it with delight. This idea appears applicable to such of the polite arts as affect the mind by the hearing as well as by the sight, and it is a matter that is highly essential.

The second rule is, that every artist ought necessarily to labour in the improvement of his taste, in acquiring that sensible, refined, and clear discernment, by which he will be enabled to distinguish the real beauty in each object, the ornaments that are agreeable to it, and the proportions and relations that subsist among the several parts, and by this faculty he will be regulated in the employment of his natural talents. This labour consists not only in the profound reflections he will make on the properties of objects as they relate to the fine arts; but also in a constant and diligent study of the grand models of beauty.

The third rule, to be observed in the practice of the polite arts, is the imitation of nature. Every object in the universe has its peculiar nature, of which the artist should never lose sight in his manner of treating it. In vain will he otherwise ornament his work with the most refined and most brilliant strokes, for, if nature be not justly imitated, it will for ever remain imperfect. The sublime Homer has sometimes sinned against this rule, for, as the gods have a nature peculiar to themselves, it cannot be a just imitation when we attribute to them passions that are scarce pardonable in mortals, and make them frequently converse in a language that is at once vulgar and ridiculous. It was not to imitate nature, to put into the mouth of a hero, at the moment of a decisive battle, an harangue that must become tedious by its excessive length, and which certainly could not have been heard by the thousandth part of a numerous army. We must however observe, that this imitation of nature, which appears at first view so simple and so easy, is of all things the most difficult in practice; and that it requires a discernment so sagacious, and an expression so happy, as is rarely bestowed on man.

Perspicuity forms the fourth rule of expression. In all the fine arts, in general, an obscure, perplexed, ambiguous, and elaborate expression is always bad. The true, striking beauty must be distinct, and perceptible to the most ignorant of mankind as well as the most learned. There are very false or inferior beauties that have occasion for a covering, a kind of veil that may make them appear greater than they really are: true beauty wants no veil, but shines by its native lustre. From the union of the true imitation of nature with perspicuity of expression arises that truth which is so essential in the productions of the fine arts.

In all the polite arts, and in all the subjects they embrace, there must necessarily reign an elevation of sentiment, that expresses each object in the greatest perfection of which it is susceptible, that imitates Nature in her most exalted beauty. This makes the fifth general rule. The design of the fine arts being to excite pleasure by the expression of that which is beautiful, every artist should raise himself above his subject, and, choosing the most favourable light wherem to place it, should there embellish it with the greatest, most noble, and beautiful ornaments, that his own genius can suggest; still, however, observing a strict imitation of nature.

From the observation of these two last rules results the sublime, which is the union of the greatest perspicuity with the strictest truth and most exalted elevation possible. It is necessary to remark here, that the most simple and common subjects are susceptible of a sublimity that is agreeable to their nature. An idyl or landscape may be as sublime in their kind as an epic poem or a history piece. When Moses begins the book of Genesis with these words, In the beginning, God created the heaven and the earth, or when he tells us, that God said, Let there be light, and there was light; these expressions are sublime in the highest degree, because they are perfectly clear, true, and elevated. Every author should therefore strive after the sublime in every subject that he undertakes; and this makes the sixth and last general rule in the practice of the polite arts. But if he cannot attain to this, it is, however, indispensably necessary that he constantly make use of expressions that are noble and refined. Every thing that is low, modest, or disagreeable, is naturally repugnant to the sublime, and ought to be for ever banished from all works related with the noble and liberal arts.

ART AND PART, is a phrase used in the north of England, and in Scotland. When any one is charged with a crime, they say he is art and part in committing the same; that is, he was concerned both in the contrivance and in the execution of it. See ACCESSARY.

ART VETERINARY, is the present improved state of surgery, as taught at a newly established institution, called the Veterinary College, at Camden Town in the parish of Saint Pancras, where the pupils attend 12.

tures upon anatomy, physiology, and medicine, under a professor of eminence, as well as the practical part of the business at the forge and in smithery, till, being properly qualified, they pass the necessary examination before a community of surgeons, when they receive their diploma, and embark for themselves as veterinary surgeons in the service of the public; or possess the privilege of an immediate appointment in his majesty's service, under the patronage of the commander in chief, at a stipend which does honour to the institution. See VETERINARY COLLEGE.

**ARTA, or LABTA** (the ancient Ambracia) A sea-port town of Lower Albania, in Greece. Lat. 39° 29' N. Lon. 21° 20' E.

**ARTABA**, an ancient measure of capacity used by the Persians, Medes, and Egyptians. The Persian artaba is supposed to have contained about 106½ pounds of wine or water, or 126½ pounds of wheat. The Egyptian artaba contained 134 pounds of wine or water, 100 pounds of wheat, or 60 of flour.

**ARTAGE**, the name of a colony established by the Milesians in Phrygia, in the year before Christ 694. Venus had a temple in that place, whence her name Artacia.

**ARTAKATA**, the metropolis of Armenia, and from its foundation the residence of all the Armenian kings. This city, as Strabo informs us, was built upon a plain which Hannibal gave to king Artaxas, who made it the capital of Armenia.

**ARTAXERXES I.** surnamed Longimanus, because one of his hands was longer than the other, was the third son of Xerxes, king of Persia. He slew his eldest brother, Darius, on suspicion of his being guilty of the murder of his father, which crime was, in fact, committed by Artabanus, captain of the guards. Artaxerxes then ascended the throne, B. C. 466, and in his time peace was restored between Persia and Athens, after a war of 51 years. Artaxerxes is generally supposed to have been the Amanerus of scripture, who married Esther, and by whose permission Ezra restored the Jewish religion at Jerusalem. The 70 weeks of Daniel are also dated in his reign. He died B. C. 424, and was succeeded by his only son, Xerxes. (Watkins.)

**ARTAXERXES II.** surnamed Mnemon, on account of his extraordinary memory, was the eldest son of Darius Nothus, and began his reign B. C. 404. His brother, Cyrus soon after formed a conspiracy against him, for which he was sentenced to death, but at the intercession of his mother, Parysatis, he was banished to Asia Minor. This act of kindness Cyrus repaid by mustering a large army of Asiatics, and hiring some Greek troops, under Clearchus, with which he marched to Babylon, but was met by Artaxerxes, and after an obstinate battle, defeated Cyrus himself, being numbered with the slain. The Greeks, however, escaped in retreat, and returned home safe. This retreat is recorded by Xenophon, and is one of the most brilliant military acts of antiquity. His prince was governed by his

mother, who conducted her barbarities, and at length poisoned the queen, Satira, which caused the death of her son, who ordered her to be confined; but afterwards re-admitted her to court, where her power was as great as before. This prince married his own daughter; such was the morality of that age! Artaxerxes died at the age of 94, after reigning 62 years. (Watkins.)

**ARTAXERXES III.** succeeded his father, the preceding monarch, B. C. 359. To pave his way to the succession, he murdered two of his brothers, and after he had gained what he wanted, put to death all the remaining branches of the family. He quelled several insurrections that were raised against him. When in Egypt, he slew the sacred bull, Apis, and gave the flesh to his soldiers, for which his favourite eunuch, Bagoas, who was an Egyptian, caused him to be poisoned, and gave the carcase, cut into small pieces, to the cats, and then made knife-handles of his bones. This happened B. C. 338.

**ARTEDI** (John), a Swedish naturalist, was born in 1705, and educated in the university of Upsal. He had an ardent passion for all branches of natural history, but he excelled most in that branch of it which is termed ichthyology. He contracted a close friendship with the celebrated Linnæus; they made each hear to the other's manuscripts in case of death. He died at Amsterdam. He was going to sup with his friend Seba; and the night being dark, he fell into the canal and perished. This happened in 1735. Linnæus published in 1738, his *Bibliotheca Ichthyologica*, and his *Philosophia Ichthyologica*. But the most valuable edition of Artedi's works was finished in 1792 by Dr. Walbaum of Lubeck.

**ARTE'DIA** In botany, a genus of the class and order pentandria digynia. Involucres pennatifid; Sorets of the centre male, fruit rough with scales. The only known species is a native of mount Libanus.

**ARTEMIDORUS**, famous for his treatise upon Dreams, was born at Ephesus, but took upon him the surname of Daldianus in this book, by way of respect to his mother's country, Daitus. He styled himself the Ephesian in his other performances. He not only bought up all that had been written concerning the explication of dreams, which amounted to many volumes; but spent many years in travelling, in order to contract an acquaintance with fortune-tellers; he also carried on an extensive correspondence with all the people of this sort in the cities and assemblies of Greece, Italy, and the most populous islands, collecting at the same time all the old dreams, and the events which are said to have followed them. The work which he wrote on dreams consisted of five books: the first three were dedicated to one Cassius Maximus, and the last two to his son, whom he took a good deal of pains to instruct in the nature and interpretation of dreams. This work, though filled with frivolous observations, contains some things that are interesting. It was first printed

ed in Greek, at Venice, in 1545, and Regalius published a translation at Paris, in Greek and Latin, in 1603, and added some notes. Artemidorus wrote also a treatise upon Auguries, and another upon Chiromancy, but they are not extant. He lived under the emperor Antoninus Pius.

**ARTEMIS**, the Greek name of Diana. Her festivals, called Artemisia, were celebrated in several parts of Greece, particularly at Delphi.

**ARTEMISIA**, wife of Mausolus king of Caria, has immortalised herself by the honours which she paid to the memory of her husband. She built for him in Halicarnassus a very magnificent tomb, called the Mausoleum, which was one of the seven wonders of the world, and from which the title of mausoleum was afterwards given to all tombs remarkable for their grandeur, but she died of regret and sorrow before the Mausoleum was finished. She appointed panegyrics to be made in honour of him, and proposed a prize of great value for the person who should compose the best. He died about the end of the 106th Olympiad, 351 years before the Christian era.

**ARTEMISIA**, queen of Caria, and the daughter of Lagdamus, marched in person in the expedition of Xerxes against the Greeks, and performed wonders in the sea-fight near Salamis, 480 years before the Christian era. Being pursued by an Athenian vessel, she attacked one of the Persian ships, commanded by Demasthymus, king of Calyndus, her enemy, and sunk it, on which the Athenians, thinking that her ship was on the side of the Greeks, ceased their pursuit; but Xerxes was the principal person imposed upon in this affair, for believing she had sunk an Athenian vessel, he declared, that "the men had behaved like women, and the women like men." Xerxes intrusted her with the care of the young princes of Persia, his sons, when, agreeably to her advice, he abandoned Greece, in order to return to Asia. These great qualities did not secure her from the weakness of love: she was passionately fond of a man of Abydos, whose name was Dardanus, and was so enraged at his neglect of her, that she put out his eyes while he was asleep. The gods, in order to punish her for this, inspired her with still a stronger passion for him, so that the oracle having advised her to go to Lencas, which was the usage of desperate lovers, she took the leap from thence, and was interred at that place. Many writers confound this Artemisia with the former, the wife of Mausolus.

**ARTEMISIA**, in botany, mugwort, a genus of the class and order syngenesia, polygamia superflua. Receptacle naked or villous downy, calyx imbricate, with rounded, connivent scales; florets of the margin subulate, very entire. More than seventy species in different parts of the globe. They may be subdivided into, 1 shrubs or undershrubs, 2 herbaceous with the stem quite simple, and flowers racemed, 3 herbaceous, with stem more or less branch-

ed, flowers panicled, leaves compound, more or less shrubby, with branched stem and undivided leaves. The species chiefly entitled to notice are:

**A. abrotanum** Southernwood. See **ABROTANUM**.

**A. absinthium** Wormwood: known officially by the name of *absinthium vulgare*; a native of our own country, and employed in medicine as a tonic, stomachic, and anthelmintic. It is also used externally as an antiseptic in fomentations. The Edinburgh Pharmacopoeia gives a form for a tincture of its flowers, but the extract of the plant is a more elegant mode of communicating its virtues.

**A. judiacum**, or *santonica*. *Santonicum*, which see.

**A. maritima** *Absinthium maritimum*, or sea-wormwood.

**A. pontica** *Absinthium ponticum*, or Euxine wormwood.

**A. rupestris** the genus album of the pharmacopoeias. See **GENIFI ALBUM**.

**A. vulgaris**, from the dried tops of which plant the Japanese prepare their moxa. See **MOXA**.

**ARTEMISIUM**, either a promontory (*Harporation*), or a part of the sea-coast, on the north-east of Euboea (*Plutarch*), called Leon, and *Cale Acte* (*Ptolemy*), memorable for the first sea-engagement between the Greeks and Xerxes. — Another promontory of Caria (*Strabo*). A third in Spain, now called cape Martin, in Valencia, in the meridian of London, and lat 38 50.

**ARTEMIUS**, a mountain of Peloponnesus.

**ARTERIAL**, *a* (from *artery*.) That relates to the artery, that is contained in the artery (*Blackmore*).

**ARTERIE ADIPOSEE** The arteries which secrete the fat about the kidneys are so called. They are branches of the capsular and diaphragmatic, renal and spermatic arteries.

**ARTERIE VENOSAE** The four pulmonary veins were so called by the ancients.

**ARTERIOSUS DUCTUS**. See **DUCTUS ARTERIOSUS**.

**ARTERIOTOMY** (*arteriotomia*, from *arteria*, an artery, and *tomos*, to cut) The opening of an artery. This operation is only performed on the temporal artery.

**ARTERY** (*arteria*, from *ang*, air, and *terno*, to keep, or contain, because the ancients believed they carried the finer parts of the blood, mixed with air) Arteries are membranous pulsating canals, or hollow muscles, which gradually become less in diameter, but more numerous in their ramifications, as they proceed from the heart. They are possessed of three tunics; an elastic or outermost, a muscular or central, and an inelastic or innermost which serves as a lining to the other two. In the larger arteries or those nearest the heart the elastic tunic is stronger than the muscular, by which contrivance the arterial canal is never too largely dilated by the action of the heart in its systole or muscular contraction.

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The muscular power or tone of the arteries, however, increases as they recede from the heart, and ramify into smaller branches, till at length, in the more minute, it is considerably superior to the elastic power, and in the capillaries is almost the only tonic, though perhaps not quite so, that exists. Whence their ease of collapsing; which should seem to proceed from the predominance of the muscular action over the elastic. Yet it is probable that in no instance is the collapse altogether perfect, some small elastic power being still continued through the remotest artery, and preventing such an effect, whence in hemorrhages, their cessation proceeds conjointly from collapse of the mouths of the divided arteries and coagulation of the coagulating lymph of the blood. They originate from the heart, the pulmonary artery from the right ventricle, and the aorta from the left the other arteries are all branches of the aorta. Their termination is either in small veinless veins, or in capillary exhaling vessels, or they anastomose with one another. It is by their means that the blood is carried from the heart to every part of the body, for nutrition, preservation of life, generation of heat, and the secretion of the different fluids. The action of the arteries, called the pulse, corresponds with that of the heart, and is effected inversely by the contraction of their muscular, and the elasticity of their unyielding coats.

## A Table of the Arteries.

All arteries originate from the pulmonary artery or the aorta.

The pulmonary artery emerges from the right ventricle of the heart and soon divides into a right and left branch, which are distributed by innumerable branches through the lungs.

The aorta arises from the left ventricle of the heart, and supplies every part of the body with blood in the following order

- a. It first forms an arch;
- b. It then descends along the spine, and
- c. It divides into the two iliacs.

a. The arch of the aorta gives off three branches

I. The arteria uncommunata, which divides into the right carotid and right subclavian

II. The left carotid.

III. The left subclavian

I. The carotids are divided into external and internal.

The external carotids give off

1. The thyroid,
  2. The lingual,
  3. The labial,
  4. The inferior pharyngeal,
  5. The occipital,
  6. The posterior auricular,
  7. The internal maxillary, from which the spongy artery of the dura mater, the lower maxillary, and several branches about the palate and orbit arise,
  8. The temporal
- The internal carotid affords
1. The ophthalmic,

2. The middle cerebral,

3. The ophthalmic, which anastomoses with the vertebral

II. The subclavians give off the following branches

1. The internal mammary, from which the thymic, coarctation, pericardiac, and phrenico-pericardiac arteries arise,

2. The inferior thyroid, which gives off the tracheal, ascending thyroid, and transverse humeri,

3. The vertebral, which proceeds within the vertebrae, and forms within the cranium the basilar artery, from which the anterior cerebelli, the posterior cerebri, and many branches about the brain are given off,

4. The cervicalis profunda,

5. The cervicalis superficialis,

6. The superior intercostal,

7. The supra-scapular

As soon as the subclavian arrives at the arm-pit, it is called the axillary artery, and when the latter reaches the arm, it is called the brachial,

The axillary artery gives off

1. Four mammary arteries,
2. The supra-scapular,
3. The posterior circumflex,
4. The anterior circumflex which ramify about the shoulder joint

The brachial artery gives off

1. Many lateral branches,
2. The profunda humeri superior,
3. The great anastomosing artery, which ramifies about the elbow-joint,

The brachial artery then divides, about the bend of the arm, into the ulnar and radial arteries, which are ramified to the ends of the fingers

The ulnar artery gives off

1. The several recurrent branches,
2. The common interosseal, of which the dorsal ulnar, the palmaris profunda, the palmar arch, and the digitalis are branches

The radial artery gives off

1. The radial recurrent,
2. The superficialis volae, and then divides into the palmaris profunda and the digitalis

b. The descending aorta gives off

In the breast,

1. The bronchial,
2. The oesophageal,
3. The intercostals,
4. The inferior diaphragmatic,

Within the abdomen,

1. The coeliac, which divides into three branches.

1. The hepatic from which are given off, before it reaches the liver,

2. The duodeno-gastric, which sends off the right gastro-epiploic and the pancreatoduodenal;

3. The pilorica superior hepatica,

4. The coronaria ventriculi,

5. The splenic, which unites the great and small pancreatic, the posterior gastric,



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the left gastro-epiploic, and the *vena bre-*  
*via*,

- 2 The superior mesenteric,
- 3 The emulgent,
- 4 The spermatic,
- 5 The inferior mesenteric,
- 6 The lumbar arteries,
- 7 The middle sacral

c The aorta then bifurcates into the iliacs, each of which divide into external and internal  
The internal iliac, called also hypogastric, gives off

- 1 The lateral sacral,
- 2 The gluteal,
- 3 The ischiatic,
- 4 The pudical, from which the external hæmorrhoidal, the perineal, and the arteria penis arise,
- 5 The obturator

The external iliac gives off, in the groin,

- 1 The epigastric,
- 2 The circumflexa iliaca,

It then passes under Poupert's ligament, and is called the femoral artery, and sends off

- 1 The profunda,
- 2 The ramus anastomoticus magnus, which runs about the knee joint,

Having reached the ham, where it gives off some small branches, it is termed the popliteal. It then divides into the anterior and posterior tibial

The tibia's antica gives off

- 1 The recurrent,
- 2 The internal malleolar,
- 3 The external malleolar,
- 4 The tarsal,
- 5 The metatarsal,
- 6 The dorsales externa halienis

The posterior tibial sends off

- 1 The nutritia tibiae,
- 2 Many small branches,
- 3 The internal plantar,
- 4 The external plantar, from which an arch is formed, that gives off the digital of the toes. For the rest, see ANATOMY

ARTFUL *a* (from *art* and *full*) 1 Performed with art (*Dryden*) 2 Artificial, not natural 3 Cunning, skilful, dexterous (*Pope*)

ARTFULLY *ad* (from *artful*) With art, skilfully, dexterously (*Rogers*)

ARTFULNESS *s* (from *artful*) 1 Skill (*Cheyne*) 2 Cunning

ARTHANITA (*arthanista*, *aplanista*, from *arros*, bread, because it is the food of swine) The herb sow bread. See CYCLAMEN

ARTHRITICAL ARTHRITIC *a* (from *arthritis*) 1 Gouty, relating to the gout (*Arbutnot*) 2 Relating to joints (*Brown*).

ARTHRITIS (*arthritis*, from *arros*, a joint) The gout. A disease arranged by Cullen in the class pyrexia, and order phlegmasie. It begins with an excruciating pain in the part, which swells and inflames, induces a high degree of fever, and mostly terminates by resolution or the deposition of a

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alky matter. The species of this complaint are arthritis regularis, arthritis atonica; arthritis retrograda, and arthritis aberrans.

It would nevertheless have been more correct to have denominated this disease by the term podagra, which by the Greeks was exclusively appropriated to the gout, since arthritis and arthritic are terms applied to the gout in common with other diseases that like itself affect the region of the joints.

ARTHRODIA (*arthrodes*, from *arthro*, to articulate) A species of diarthrosis, or moveable connection of bones, in which the head of one bone is received into the superficial cavity of another, so as to admit of motion in every direction, as the head of the humerus with the glenoid cavity of the scapula.

ARTHRODYNIA (*arthrodynia*, from *arthro*, a joint, and *dyna*, pain) Chronic pains in the joints, without pyrexia. It is one of the terminations of acute rheumatism. See RHEUMATISMUS.

ARTHIROPUOSIS (*arthropuosis*, *arthropu-* *osis*, from *arthro*, a joint, and *pus*, pus) A collection of pus in a joint. It is, however, frequently applied to other affections, as lumbago psadica, &c.

ARTHUR, the celebrated hero of the Britons, is said to have been the son of Uther Pendragon, king of Britain, and to have been born in 501. His life is a continued scene of wonders. It is said that he killed four hundred and seventy Saxons with his own hand in one day, and after having subdued many mighty nations, and instituted the order of the Knights of the Round Table, died A. D. 542, of wounds which he received in battle. The most particular detail of his story and his exploits is that given by Geoffrey of Monmouth, but the probable is there so blended with the marvellous and the extravagant, that not only the truth of the whole, but even the reality of Arthur's existence, has been called in question. Mr Whitaker, however, has taken much pains to vindicate the existence, and discriminate between the real and the fabulous transactions of the British worthy.

ARTICHOKE. See CINARA.

ARTICHOKE (French) See CINARA.

ARTICHOKE (Jerusalem) Although formerly in estimation for the table, this plant, *helianthus tuberosus* of Linnæus, is now neglected, it being apt to produce flatulency and dyspepsia.

ARTICLE, ARTICULUS, a little part or division of a book, writing, or the like — Aquinas divides his sum of theology into several questions, and each question into divers articles — Such an account consists of so many articles.

ARTICLE is also applied to the several clauses or conditions of a contract, treaty of peace, or the like. In this sense we say, articles of marriage, articles of capitulation, preliminary articles, &c.

ARTICLE OF FAITH is by some defined a point of Christian doctrine, which we are

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obliged to believe, as having been revealed by God himself, and allowed and established as such by the church

**ARTICLES OF RELIGION**, in the church of England. In the early ages of Christianity, the declaration that was required of a Christian's faith was conceived in very general terms; but, as heresies sprung up, it was thought necessary to guard against them, by enlarging the creeds or confessions of faith. It was in imitation of this procedure that the Reformers were so copious in stating the doctrines of the church of England in that work which is entitled, "Articles whereupon it was agreed by Archbishops and Bishops of both provinces, and the whole Clergie, in the Convocation holden at London, in the year of our Lorde God 1562, according to the computation of the Church of Englande, for the voiding of the diversities of opinions, and for the establishing of consent touching true religion." There were two particular circumstances in that time which made this seem to be the more necessary the one was, that there sprung up, together with the Reformation, many sects; the other, that, having but just got rid of Popery, it was absolutely necessary to take the utmost precautions against it for the future. These articles were prepared, as is most probable, by the bishops Cramer and Ridley, and were published by royal authority. The most authentic manuscript of them is in the library of Corpus Christi college in Cambridge. It belonged to archbishop Parker, and was left by him to that college.

The subscription to these articles is enjoined by statute, which establishes them, and requires every clergyman to declare his assent, and subscribe them in the presence of his ordinary. The form of the subscription is not prescribed by the statute, but by the canon it is expressly required, that he acknowledge them, and every one of them, to be agreeable to the word of God. There is a clause in the statute, which subjects every minister, who maintains any doctrine repugnant to these articles, to deprivation. Notwithstanding this, however, very different opinions have been entertained by those who subscribe these articles concerning them, and wide differences of opinions have likewise subsisted with regard to the nature and extent of subscription. Some have interpreted them more laxly, and others more rigidly, and disagree much as to the extent to which their sentiments may run consistent with subscription so that, articles of religion, and a subscription, manifestly fail entirely in producing the great object for which they were established, namely, "Unity of Faith."

Indeed, as the excellent and judicious Dr Hartley has long ago observed, it seems entirely useless to all good purposes, to the promotion of piety and benevolence, in the present state of things, to form any creeds, articles, or systems of faith, and to require from clergymen or others an assent to these in words, or written. Men are to be influenced even in

respect of the principal doctrines of God's providence, a future state, and the truth of the scriptures, by rational methods only, not by compulsion. This seems acknowledged on all hands. Why then should harsher methods be used in things of confessedly less importance? It is true, that magistrates have a power from God to inflict punishment upon such as disobey, and to confine the natural liberty of acting within certain bounds, for the common good of their subjects. But all this is of a nature very foreign to the pretences for confining opinions by discouragements and punishments.

Those who believe neither natural nor revealed religion practically, will be held by no restraints; they will appear to consent to any thing, just as their interest leads them. And this is the case of a great part of the subscribers in all Christian communities. They have a mere nominal faith only, at the time of subscribing, not even a speculative or historical one. or, if they have any degree of seriousness, and good impressions, they must do proportional violence to these by performing a religious act out of a mere interested view.

If the person be an earnest believer of natural religion, but an unbeliever in respect of revealed (to suppose this possible for argument's sake), he will not attempt any office in the Christian ministry. However, he ought not to be deprived of civil privileges, whilst so many wicked nominal Christians are suffered to enjoy them.

Suppose the person required to subscribe to be a speculative historical believer, why should his future enquiries be confined? How can he enquire honestly, if they be? How can a person be properly qualified to study the word of God, and to search out its meaning, who finds himself previously confined to interpret it in a particular manner? If the subject matter of the article be of great importance to be understood and believed, one may presume that it is plain, and needs no article, if of small importance, why should it be made a test, or insisted upon? If it be a difficult, abstruse point, no one upon earth has authority to make an article concerning it. We are all brethren there is no father, no master, amongst us we are helpers of, not lords over, each other's faith. If we judge from other branches of learning, as natural philosophy, or physic, we shall then find, that the pure evidence of the things themselves is sufficient to overcome all opposition. The doctrines of gravitation, of the different refrangibility of the rays of light, of the circulation of the blood, &c can never be believed to any useful practical purpose, till they be examined and understood, and those, who now believe them, affirm, that this is all that is necessary for their universal reception. If they should be mistaking in this, free examination would be so much the more requisite.

The apostles' creed is so plain and clear, except in the three articles, concerning the descent of Christ into hell, the holy catholic church and the communion of saints that no



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one who believes the truth of the scriptures, can hesitate about it; not even how to interpret the three forementioned articles, in a sense agreeable to the scriptures. As to the metaphysical subtleties which appear in the subsequent creeds, they can at best be only human interpretations of scripture words; and therefore can have no authority. Words refer to words, and to grammatical and logical analogies, in an endless manner, in these things; and all the real foundation which we have is in the words of scripture, and of the most ancient writers, considered as helps not as authorities. It is sufficient, therefore, that a man take the scriptures for his guide, and apply himself to them with an honest heart, and humble and earnest prayer, which things have no connection with forms and subscriptions.

Nay, it seems needless, or ensnaring, to subscribe even to the scriptures themselves. If to any particular canon, copy, &c. ensnaring, because of the many real doubts in these things. If not, it is quite superfluous from the latitude allowed. Yet still it appears uncontested that no careful, impartial enquirer can doubt of the great truths of the scriptures, such as the miraculous birth, life, death, resurrection, and ascension of Christ, &c. or of the practical consequences thence arising, and surely it cannot be necessarily requisite, that a man should believe more than these.

For, let us suppose the person required to assent, or subscribe, to be a *bona fide* believer. It can scarcely be supposed, that such a person should assent to any set of articles, so as honestly to affirm, that he would choose to express his own sense of the scripture language in these words. To strain either the scriptures, or the articles, must be a very ungrateful task to an ingenuous man, and perhaps there may be so wide a difference in some instances in his opinion, that no straining can bring them together. And thus some of the most earnest believers are excluded from the Christian ministry, and from certain common privileges of society, by a method, which suffers nominal wicked Christians to pass without difficulty.

If it be objected, that, unless preachers subscribe, they may teach different doctrines, it is obvious to answer that they do this, though they do subscribe, and that in the most important practical points. If the scriptures cannot yet produce a true unity of opinion on account of our present ignorance, and the weakness and wickedness of our natures, how should articles do this? Men can put as different senses upon articles as upon texts, and so dispute without end.

We may add, however, that though creeds, articles, &c. seem to have no use now, but even to be prejudicial to the cause of truth in themselves, yet it no way becomes a Christian to declaim against them in violent terms, or oppose them with bitterness, but merely, in a plain dispassionate way, to represent the truth of the case, so as by degrees to draw men's zeal from these less matters, and transfer it upon greater. "Let not him that eateth despise

him that eateth not, and let not him which eateth not, judge him that eateth." Hartley on Man, vol. II. p. 366.

**ARTICLE**, in grammar, denotes a particle used in most languages for the declining of nouns, and denoting their several cases and genders. The use of articles arises chiefly hence, that in languages which have no different terminations, to express the different states and circumstances of nouns, there is something required to supply that office. The Latins have no articles, but the Greeks, and most of the modern languages, have had recourse to them, for fixing and ascertaining the vague signification of common and appellative names.

Many and severe have been the disputes among grammarians upon the use and meaning of these little words. Reasoning oftentimes from a metaphor, they persuade themselves at last that they have made some notable discovery, and because in a building there must be joists and nails, we must have in language little words or pegs to keep all things together. Thus Mr Harris, whose knowledge was derived from the Greek language and Greek grammarians, and whose principles, as is natural from knowledge founded on so narrow a basis, are contradicted by the slightest acquaintance with the Teutonic and Arabic, leads us through many a maze, and we might have wandered till this moment, if Mr. Tooke, in his excellent work on the word *that*, enlarged in his *Epea Pteroenta*, had not pointed out to us the open and straight road of etymology, when we can travel upon it, and, when that fails us, of analogy. In the English language we call the words *a* and *the* articles. The Germans have *ein* and *der* the French *un* and *le* the Greeks *ἓ* the Hebrews *ו* but the unfortunate Latins are said to be without these joints and pegs in speech. But if one language is without them, they are, it is evident, not essential to language and it will be found difficult to make such a definition as shall exclude a variety of words, such as, *hic, this, that, &c.* from making a part of this division.

In the languages above mentioned the precise meaning of the words, *the, der, le, il*, and *ו*, cannot at first sight be ascertained. The English word *a* points obscurely to its meaning. The German *ein* and the French *un* clear the road for investigation. They are to be found continually applied to substantives, and mean *one* for it is obvious that in common conversation we must frequently find it necessary to limit the object of it to one of a species. As the object must sometimes be limited, at others this limitation may not be necessary, and it is curious to observe how different nations express the same idea. Thus if a thing is generally reported, we say in English "they say," meaning a great number say so; and so in French it is, *on dit*, or *unus dicit*, "one person says," so meaning more than one person by an ellipsis very common in that language. In German it is *man sagt*, by

man meaning man in general. We have thou found, that in two languages one of the articles is merely a word of number. Probably it may be so in English, *a* may mean one, or it is an abbreviation of *any*. By trying the two words it is evident, that *any* cannot be applied in the room of *a*, but that one always came, and hence we might conclude that *a* and *any* are only other words for *one*, and answer to the German *ein*.

The article *the*, as it is called, may not discover itself so easily. Yet let us try the same analogy, for the etymology of it is not ascertained. The answers to *der* of the Germans, and *le* of the French but what is *le*? the *sile* of the Latins, and hence we may reasonably presume that our word *the* is no more an article than *sile*, and in fact that it comes from some adjective of the same signification. Let us try by etymology. In German we have *der, die, das* which was anciently *ther, this (dico this) thaz*, and in the plural *thier (thier)*. This looks very much like our *the*. In the Anglo-Saxon we find *sa, seo, that* in Islandic, *sa, su, that* in Gothic, *sa, so, thata* in Hebrew, *in, u, u'* etymologists perhaps will not be displeased at our making the words *in* and *the* proceed from the same original, and we shall not be afraid of exposing ourselves to the laughter of critics, if we refer the Doric *en*, to the same stock. If we are right in our conjectures, the word *the* is as much a pronoun as the *sile* of the Latins but, if persons choose to have a distinct class of words under the name of articles, we may say, that the English has two, *a* and *the*, which "serve to define and ascertain any particular object, so as to distinguish it from the other objects of the general class to which it belongs."

Father Buffier distinguishes a third kind of articles in French, which he calls intermediate or partitive, serving to denote part of the thing expressed by the substantives they are added to as, *des savants ont cru*, "some learned men have supposed." I want *de la lumiere*, "some light." The use and distinction of the definite and indefinite articles *le* or *la*, and *de* or *du*, make one of the greatest difficulties in the French language; as being entirely arbitrary, and only to be acquired by practice.

ARTICLES OF WAR, are known regulations for the government of the army in the United Kingdom, dominions beyond the seas, and foreign parts dependant upon this country. They may be altered at the pleasure of the sovereign; and in certain cases they extend to civilians as when by proclamation any place shall be put under martial law, or when the people follow a camp or army for the sale of merchandize, or serve in any manual capacity. It is ordained that the articles of war shall be read in the circle of each regiment belonging to the British army every month, or oftener if thought proper. A soldier is not liable to be tried by a military tribunal unless the articles of war have been read to him.

To **ARTICLE** *v a* To draw up in particular articles (Taylor)

**ARTICULAR** (*articularis*, Lat.) Belongs to the joints.

**ARTICULATE** *a* (from *articulus*, Lat.)  
1. Distinct (Milton) 2 Branched out into articles (Bacon)

To **ARTICULATE** *v a* (from *articulus*)

1. To form words; to speak as a man (Glan)

2. To divide up in articles (Shakspeare) 3

To make joints (Shakspeare)

**ARTICULATA**, in botany See **JOINTED**

**ARTICULATELY** *ad*. (from *articulate*)

In an articulate voice (Decay of Piety)

**ARTICULATENESS** *s*. (from *articulate*). The quality of being articulate

**ARTICULATION** *s*. (from *articulate*)

1 The juncture, or joint of bones (Ray)

2 The act of joining words (Holder) 3 [In botany] The joints in plants

**ARTICULATION**, in anatomy, (*articulatio*, from *articulus*, a joint.) The connection of one bone with another. There are three genera of articulations, viz diarthrosis, or moveable connexion, synarthrosis, or immoveable connexion, and symphysis, or mediate connexion. See **DIARTHROSIS**, **SYNARTHROSIS**, and **SYMPHYSIS**

Table of the Connexions of Bones

I. **Diarthrosis**, or moveable connexion

This genus contains five species

1. Enarthrosis,
- 2 Arthrodia,
- 3 Ginglymus,
- 4 Trochoides,
- 5 Amphiarthrosis.

II **Synarthrosis**, or immoveable connexion

This genus comprehends three species

- 1 Suture,
- 2 Harmony,
- 3 Gomphosis

III **Symphysis**, or mediate connexion, which has five species

- 1 Lynchondroasis,
- 2 Syarcosis,
- 3 Synchrosis,
- 4 Syndesmosis,
- 5 Synostosis

For the rest, see **ANATOMY**

**ARTICULATION** is often considered as a branch of elocution; and in this sense a good articulation consists in giving every letter in a syllable its due proportion of sound, according to the most approved custom of pronouncing it; and in making such a distinction between the syllables of which words are composed, that the ear shall, without difficulty, acknowledge their existence, and perceive at once to which syllable each letter belongs. Where these points are not observed, the articulation is proportionally defective. Exactness in sounding the words rightly, corresponds to propriety in spelling, and the articulation should be so clear and distinct, that the hearer may with ease keep pace with the speaker. See **Sheridan's Lectures on Elocution**, p 19

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**ARTIFICE** *s* (*artificium*, Latin) 1

Trick, fraud, stratagem (South) 2 Art, trade.

**ARTIFICER** *s* (*artifex*, Latin) 1. An

artist, a manufacturer (*Shakspeare*) 2 A contriver or artful fellow (*B Jonson*).

**ARTIFICIAL** *a* (*artificiel*, Fr.) 1 Made by art, not natural (*Wilkins*) 2 Fictitious, not genuine (*Shakspeare*) 3 Artful, contrived with skill (*Temple*).

**ARTIFICIAL LINES**, on a sector or scale, are certain lines so contrived, as to represent the logarithmic sines and tangents; which, by the help of the line of numbers, will solve all questions in trigonometry, navigation, &c pretty exactly.

**ARTIFICIALLY** *ad.* (from *artificial*) 1 Artfully, with skill, with good contrivance (*Ray*) 2 By art; not naturally (*Addison*).

**ARTIFICIALNESS** *s* (from *artificial*) Artfulness.

**ARTILLERY**, is originally a French word signifying archery. In a general sense it denotes the offensive apparatus of war, particularly of the missile kind. In modern acceptation it refers to the heavy equipage of war, comprehending all sorts of large fire arms, with their appurtenances, as cannon, mortars, howitzers, balls, shells, petards, muskets, carbines, &c being what is otherwise called ordnance. The term is also applied to the larger instruments of war used by the ancients, as the catapult, balista, battering ram, &c.

The term Artillery, or Royal Artillery, is also applied to the persons employed in that service, and likewise to the art or science itself, and formerly it was used for what is otherwise called pyrotechnia, or the art of fireworks, with the apparatus and instruments belonging to the same.

In England the science of artillery early engaged attention. Lord Herbert informs us that, in 1544, king Henry VIII had himself invented small pieces of artillery to defend his waggons. Since then the practice of artillery has been gradually improving, and the number of men employed in that service as regularly augmenting. The artillery of Great Britain is now extended to ten battalions of foot, with one troop of horse-artillery to each battalion, and their officers have for the greater part of a century enjoyed the most important advantages, in receiving the various preliminary branches of polite, literary, and scientific instruction connected with their profession; in the Royal Academy at Woolwich, originally established for their education exclusively.

For the construction of iron guns for battering pieces, and garrison, and ship-guns, mortars, howitzers, and for other particulars relative to artillery in general, see the articles **CANNON, MORTARS, HOWITZERS, GUNNERY, and PROJECTILES**.

It would appear at a superficial view, that the adoption of cannon and gunpowder in war had rendered it more bloody and destructive than the method of fighting and the arms formerly in use; but the reverse of this will be found in reality to have taken place. The chief contest in modern warfare is for posts and

stations, where artillery can have such command of the adjoining ground as to give a material superiority; and as the chief combat is carried on from a distance, on a reverse of fortune the defeated have more opportunities of safe retreat. Hence mere extermination of an enemy ceases to be the ultimate design of war: when a post is seized, those under its influence no longer think of contending, the odds against their success are so excessive, that it ceases to be any disgrace to yield, and those become prisoners of war who in the ancient warfare must have been devoted to massacre. In the history of remote periods, we often read of 200,000 or more men entering the field of battle, and not more than a dozen or two escaping alive, and in a few instances not even so many. Such sanguinary terminations to engagements never now occur, and it often happens that in a long campaign not more lives are lost than formerly have perished in a single battle.

The following observations of Dr Smith on the subject shew still more the advantage to mankind in general of the use of cannon, and other modern instruments of war.

“In modern war the great expense of fire-arms gives an evident advantage to the nation which can best afford that expense, and consequently to an opulent and civilized over a poor and barbarous nation. In ancient times the opulent and civilized found it difficult to defend themselves against the poor and barbarous nations. In modern times the poor and barbarous find it difficult to defend themselves against the opulent and civilized. The invention of fire-arms, an invention which at first sight appears to be so pernicious, is certainly favourable both to the permanency and to the extension of civilization.” *Nicholson's Encycloped*

There have been many authors on the subject of artillery, the principal of which are Bucherus, Braunnus, Tartalea, Collado, Sardi, Usano, Hanzeler, Digges, Moretti, Summenowitz, Mieth, d Avelour, Manesson, Mallet, St Julien, and the later authors, of still more consequence are Belidor, St Remy, le Blond, Valiere, Morogues, Puget, Coudray, Rohms, Muller, Antoni, Tignola, Scheele, to which may be added the extensive and accurate experiments published in Dr Hutton's volume of Tracts, and in the Philos Transac for 1778.

**ARTILLERY (Brigade of)**, generally consists of eight or ten pieces of cannon, with all the machinery and officers to conduct them, and all the necessary apparatus thereto belonging.

**ARTILLERY COMPANY**, a regular battalion of infantry under the command of officers who are annually elected. It consists of gentlemen of character and property, bound by solemn declaration and obligation of attachment and fidelity to the king and constitution, and of readiness to join in supporting the civil authority, and of defending the metropolis. See the History of this Company, by A. Haghmore, esq

## ART

**ARTILLERY (Field)**, includes every requisite to forward the operations of an army, or of any part of an army acting offensively or defensively, in the field. Field artillery may be divided into two distinct classes: field artillery properly so called, and horse artillery.

Regiments of artillery are always encamped half on the right and half on the left of the park. The company of bombardiers (when they are formed into companies) always takes the right of the whole, and the lieutenant-colonel's company the left, next to the bombardiers, the colonel's, the major's, &c. so that the two youngest are next but one to the centre or park, the two companies next to the park are the miners on the right, and the artificers on the left.

The colours are placed in the centre of the front line of guns, in the interval of the two alarm-guns, in a line with the bells of arms of the companies.

The lieutenant-colonels and majors' tents front the centres of the second streets from the right and left of the regiment.

**ARTILLERY (March of)** The marches of the artillery are, of all the operations of war, the most delicate, because they must not only be directed on the object in view, but according to the movements the enemy make. Armies generally march in three columns, the centre column of which is the artillery; should the army march in more columns, the artillery and heavy baggage march nevertheless in one or more of the centre columns: the situation of the enemy determines this. If they are far from the enemy, the baggage and ammunition go before or behind, or are sent by a particular road, an army in such a case cannot march in too many columns. But should the march be towards the enemy, the baggage must be all in the rear, and the whole artillery form the centre column, except some brigades, one of which marches at the head of each column, with guns loaded, and burning matches, preceded by a detachment for their safety. The French almost invariably place their baggage in the centre.

A detachment of pioneers, with tools, must always march at the head of the artillery, and of each column of equipage or baggage.

If the enemy is encamped on the right flanks of the march, the artillery, &c. should march to the left of the troops, and *vice versa* should the enemy appear in motion, the troops front that way, by wheeling to the right or left by divisions, and the artillery, which marches in a line with the columns, passes through their intervals, and forms at the head of the front line, which is formed of the columns that flanked nearest the enemy, taking care at the same time that the baggage be well covered during the action.

**ARTILLERY (Park of)**, is that place appointed by the general of an army to encamp the train of artillery, apparatus, ammunition, as well as the battalions of the artillery, appointed for its service and defence. The figure of the park of artillery is that of a parallelo-

## ART

gram, unless the situation of the ground renders another necessary.

The park of artillery is generally placed in the centre of the second line of encampment, and sometimes in the rear line, or corps of reserve. In both places the muzzles of the guns are in a line with the fronts of the sergeants' tents of the regiments of artillery and infantry. Some generals choose to place the park about three hundred paces before the centre of the front line of the army. But let the situation be where it will, the manner of forming the park is almost every where the same. The most approved method is to divide the whole into brigades, placing the guns of the first to the right of the front line, and their ammunition behind them, in one or more lines. The different brigades should be all numbered, as well as every waggon belonging to them. This method will prevent confusion in the forming and breaking up of the park, as also on a march besides, according to the numbers, the stores therein contained are known.

**Train or Train of Artillery**, a number of pieces of ordnance, mounted on carriages, with all their furniture fit for marching. To this commonly belong mortars, cannon, balls, shells, &c.—There are trains of artillery in most of the royal magazines, as in the Tower, Portsmouth, Plymouth, &c. but, above all, at Woolwich, from whence the ships commonly receive their ordnance, and where they are all completely proved before they are received into the public service.

At the battle of Jemappe, which was fought between the French and Austrians on the 6th of November, 1702, the latter had 120 pieces of cannon disposed along the heights of Framery, whilst their effective force in men did not exceed 17,000. The French on this occasion brought nearly the same quantity of ordnance, some indeed of extraordinary calibre, but their strength in men was considerably more formidable.

**ARTISAN (French)** 1 Artist, professor of an art (*Wotton*). 2 Manufacturer, low tradesman (*Addison*).

**ARTIST s (artiste, Fr)** 1 The professor of an art (*Newton*). 2 A skilful man, not a novice (*Locke*).

**ARTIST**, in a general sense, a person skilled in some art, or, according to Mr Harris's definition, a person possessing an habitual power of becoming the cause of some effect, according to a system of various and well-approved precepts. Evelyn tells us of a privilege granted at Nicenza to artists, like that of clergy in England, in virtue whereof, criminals adjudged to death saved their lives if they could prove themselves the most excellent and consummate workmen in any useful art.

**ARTIST, ARTISTA** In an academical sense, denotes a philosopher or proficient in the faculty of arts. In the early ages of universities, the seven liberal arts completed the whole course of study, or philosophy, as it was called, whence the masters of this faculty were denominated Artists. What they understood

by the liberal arts used to be summed up in the following Latin verse

Lingua, Tropas, Ratio, Numerus, Tonus,  
Angulus, Astra.

**ARTIST** is a term more peculiarly used, by Paracelsus and other adepts, for a chemist or alchemist. We find frequent mention, in authors of this class, of Elias Artista, or Elias the artist, who is to come some time before the dissolution of the world, and make perfect all arts and sciences, but especially the gold-making art, &c.

**ARTLESSLY** *ad* (from *artless*) In an artless manner; naturally, sincerely (Pope).

**ARTLESS** *a* (from *art* and *less*) 1. Unskilful, wanting art (Dryden) 2. Void of fraud as, an artless maid 3. Contrived without skill as, an artless tale

**ARTOCARPUS** (from *arctos*, bread, and *carpos*, fruit) Bread-fruit-tree a genus of the class and order monœcia monandria Male, an ament, calyxless, corol two-petalled Female, calyxless, corolless, style one; berries one-seeded, connecting and forming a roundish berried head There are two species

1 *A. inosa* The true and valuable bread-fruit tree of Otaheite and the adjoining islands, first brought into general notice by Captain Cook The tree is of the height and proportion of a middle-sized oak: the leaves are often a foot and a half long, oblong-shaped, and in colour, consistence, and sinuosity resembling those of the fig-tree, and exuding a milky juice upon their fracture The fruit is about the size and shape of a new-born child's head, covered with a thick, reticulate skin, and containing a core in its centre The eatable part lies between the skin and core, white as snow, and of the consistence of new-bread It is prepared for food by being divided into three or four parts, and then roasted its taste is sweetish, but otherwise insipid There are various other ways of cooking it The name among the natives is mahoe

2 *A. integrifolia*, called by the natives jockahee, and by our own merchants jack-tree It is a native of the East Indies, but its fruit is small and less esteemed than that of the mahoe

**ARTOIS**, a late province of the French Netherlands, now included in the department of the Straits of Calais.

**ARTOTYRITES**, a Christian sect, in the primitive church, who celebrated the eucharist with bread and cheese, saying, that the first oblations of men were not only of the fruits of the earth, but of their flocks. The word is derived from *arctos*, bread, and *tyros*, cheese

**ARVALES PRÆTRES**, in Roman antiquity, a college of twelve priests, instituted by Romulus, and chosen out of the most noble families, himself being one of that body they assisted in the sacrifices of the ambrosia annually offered to Ceres and Bacchus, for the prosperity of the fruits of the earth; when they were on their heads crowns made of ears of corn.

**ARUBA**, an island near the coast of Venezuela, in South America It is one of the

Little Antilles, and is subject to the Dutch Lat. 12° 30' N. Lon 67° 35' W

**ARVERNI**, in ancient geography, a denomination given to one of the most powerful nations of Gaul, whose country was, according to Strabo, situated between the ocean, the Pyrenees, and the Rhine.

**ARVIL-SUPER**, a feast or entertainment made at funerals in the north of England. Arvil-bread is the bread delivered to the poor at funeral solemnities; and *arvil*, *arval*, *arfal*, are terms used for the burial or funeral rites

**ARVISHUM** (from *Arvis*, a promontory of the isle of Chios, where it was made) Malindy, a rich cordial wine

**ARUM** (*arum*, from the Hebrew, *rr*, *ja-ron*, which signifies a dart, so named because its leaves are shaped like a dart, or, according to Lobelius, from *ipso*, *sacred*, as resembling the member consecrated to the indecency and fruitfulness of mankind) Wake-root or cuckow-pint, a genus of the class and order monœcia hexandria Spathe one-leaved, convolute at the base, spadix cylindrical, androgynous, naked above, bearing the stamens in the middle, and the germs at the base; berries one-celled Thirty-two species scattered over the globe It is a native tree of Guiana

**ARUM MACULATUM** The root of this species (the common cuckow-pint) is medicinal; and when recent, very acrimomous It is employed as a stimulant in chlorotic, rheumatic, and paralytic cases, mixed with oleaginous or mucilaginous substances to sheath its acrimony The London Pharmacopœia directs a conserve to be made of the fresh root

**ARUM** (African) See **CELIA**

**ARUM** (Floating) See **ORONTIUM**

**ARUNDEL**, an old borough and market town of Sussex It has a good market on Wednesdays, and a petty one on Saturdays It is governed by a mayor and burgesses, and sends two members to parliament The borough was mentioned in king Alfred's will The manor has constantly gone with the castle, and by an act of parliament passed in the reign of Henry VI it was declared, that all who should be possessed of the castle and honour of Arundel, were, and should thereby be, earls of it, without any other creation It is the only privilege of the kind in England Lat. 50° 55' N. Lon 0° 20' W

**ARUNDELIAN MARBLES**, called also the Panan Chronicle, are ancient stones, on which is inscribed a chronicle of the city of Athens, supposed to have been engraven in capital letters, in the island of Paros, 264 years before Christ. They take their name from the earl of Arundel, who procured them from the east, or from his grandson, who presented them to the university of Oxford. The authenticity of these marbles has led to a controversy between Mr. Robertson, who in his *Persian Chronicle* questioned it, and Mr. Hewlett, who defended it as a *Vindication of the Authenticity of the Panan Chronicle*, which see.



**ARUNDINACEOUS**, *a.* (*arundinaceus*, Latin.) Of or like reeds.

**ARUNDINEOUS**, *a.* (*arundineus*, Lat.) Abundant with reeds.

**ARUNDO** Reed: a genus of the class and order triandra diandria. Calyx two-valved; florets surrounded with long permanent wool. Eleven species, most of which are natives of our own country, and may be found in ditches, moist woods, and stagnant waters. The *a. arenaria* alone demands a dry soil, and chiefly flourishes on our sandy shores. The Turks make their pens from the *a. orientalis*.

**ARUNDO FLORIDA**. See **CANNA**.

**ARUNDO ROTANG**. See **CALAMUS**.

**ARUNDO LAGCHARIFERA**. See **SALICARIA**.

**ARUSPICES**, or **HARUSPICES**, in Roman antiquity, an order of priests who pretended to foretell future events by inspecting the entrails of victims killed in sacrifice; they were also consulted on occasion of portents and prodigies.

**ARX**, in the ancient military art, a town, fort, or castle, for defence of a place.

**ARX**, also denoted a consecrated place on the Palatine Mount where the augurs publicly performed their office.

**ARX BRITANNICA**, a citadel of Batavia, whose foundation is seen at low water, near the old mouth of the middle Rhine. Some imagine it the pharos or high tower of Caligula; as Suetonius calls it, a monument of Caligula's sham conquest of Britain. Others, that it was built by Drusus, with an altar afterwards by Claudius, on his expedition into Britain.

**ATYPTENIO-EPIGLOTTIDEUS** A muscle composed of a number of fibres running between the arytenoid cartilage and epiglottis. It pulls the side of the epiglottis towards the external opening of the glottis, and when both act, they pull it close upon the glottis.

**ARYTENOID CARTILAGE** (*cartilago arytenoides*, from *arytum*, a funnel, and *oides*, shape.) The name of two cartilages of the larynx.

**ARYTENOIDÆUS MINOR**. See **ARYTENOIDÆUS OBLIQUUS**.

**ARYTENOIDÆUS MAJOR**. See **ARYTENOIDÆUS TRANSVERSUS**.

**ARYTENOIDÆUS OBLIQUUS**. Arytenoid-muscle minor of Douglas. A muscle of the glottis, which arises from the base of one arytenoid cartilage, and crossing its fellow, is inserted near the base of the other arytenoid cartilage. It is a muscle that is occasionally wanting; but when present, and both muscles act, their use is to pull the arytenoid cartilages towards each other.

**ARYTENOIDÆUS TRANSVERSUS**. Arytenoid-muscle major of Douglas. An upper, or middle muscle of the glottis, that arises from the base of one arytenoid cartilage, from near its junction with the preceding muscle, and runs transversely, and is inserted in the

base of the other arytenoid cartilage. Its use is to shut the glottis, by bringing the two arytenoid cartilages, with their ligaments, nearer to each other.

**ARZES**, in ancient geography, a town of the island of Cyprus, formerly a considerable city, and see of a Greek bishop; but now reduced to a village.

**AS**, in antiquity, a particular weight, consisting of twelve ounces, being the same with libra, or the Roman pound.

As was also the name of a Roman coin, which was of different matter and weight, according to the different ages of the commonwealth.

It is also used to signify an integer (whence the English word *ars*), divisible into twelve parts, from which last acceptance it signified a whole inheritance.

The as had several divisions: the principal of which were the uncia, or ounce, being the twelfth part of the as; sextans, the sixth part of the as, quadrans, the fourth part, triens, the third part, and semis, half the as, or six ounces. Bis was two-thirds of the as, or eight ounces, and dodrans, three fourths of the as.

M. Pausanias in his *Metrolologie* estimates the value of the as, from the foundation of Rome till the year 537, at 26 sols, or a livre; though it was sometimes 29 sols from the year of Rome 537 to the year 544, at three French sols, its weight being two Roman ounces of copper from 544 to 586 at one sol ten and a half deniers, its weight being one Roman ounce from 586 to the reign of Claudius or of Nero, one sol one and a half denier from the reign of Claudius or of Nero to that of Constantine, about one sol.

As *conjunct* (*ale*, Teut.) 1 In the same manner with something else (*Shakspeare*) 2 In the manner that (*Dryden*). 3 That in a consequential sense (*Wotton*) 4 In the state of another (*A Philips*) 5 Under a particular consideration (*Gay*) 6 Like; of the same kind with (*Watts*) 7 In the same degree with (*Blackmore*) 8 As if, according to the manner that would be if (*Dryden*) 9 According to what (*Addison*) 10 As it were; in some sort (*Bacon*) 11 While, at the same time that (*Addison*) 12 Because (*Taylor*) 13 As being (*Bacon*) 14 Equally (*Dryd*) 15 How, in what manner (*Boyle*) 16 With; answering to like or same (*Shak*) 17 In a reciprocal sense, answering to as (*Bentley*) 18 Going before as, in a comparative sense, the first as being sometimes understood (*Addison*) 19 Answering to such (*Philosop*) 20 Having so to answer it, in a conditional sense (*Locke*) 21 Answering to so conditionally (*Dryden*) 22 In a sense of comparison, followed by so (*Pope*) 23 As for; with respect to (*Dryden*) 24 As if, in the same manner that it would be if (*Locke*) 25 As so; with respect to (*Swift*) 26 As well as, equally with (*Locke*) 27 As though; as if (*Shak*)

**ASA**, (*an*, from *asa*, *asa*, to heal, Heb.)

## A S A

A gum so called from its properties, as asafœtida and asaduleis

**ASA-DOLCIS.** Gum benzoin See BENZOINUM

**ASA-FŒTIDA** (from *asa*, which see.) Gum asafœtida, so denominated from its smell. The plant which affords this gum resin is the ferula asafœtida of Linnæus (ferula folius alternatim sinuatis obtusis; class petandria, order digynia), which grows plentifully on mountains in the provinces of Chôrassan and Laar in Persia. The process of obtaining it is as follows: the earth is cleared away from the top of the roots of the oldest plants, the leaves and stalks are then twisted away, and made into a covering to screen the root from the sun, in this state the root is left for forty days, when the covering is removed, and the top of the root cut off transversely, it is then screened again from the sun for forty-eight hours, when the juice it exudes is scraped off, and exposed to the sun to harden

A second transverse section of the root is made, and the exudation suffered to continue for forty-eight hours, and then scraped off. In this manner it is eight times repeatedly collected in a period of six weeks. The juice thus obtained has a bitter, acrid, pungent taste, and is well known by its peculiar nauseous smell, the strength of which is the surest test of its goodness. It is highly esteemed as an antihysterical, nervine, and stimulating remedy, and is much used in hysteria, hypochondriasis, dyspepsia, &c

**ASAM**, in geography See ASSAM

**ASAPH (St.)**, a city of Flintshire, on the river Elwy, whence the British call it Llan Elwy. It is a poor town; but has a small market on Saturdays Lat 53 12 N Lon 3 36 W

**ASAPHEIS** (from *a neg* and *σαφης*, clear, open.) A term used by Hippocrates for such patients as do not utter their words in a clear manner.

**ASAPPES**, or **AZAPES**, an inferior order of soldiers in the Turkish army, who are always exposed to the first shock of the enemy, to the end that the enemy being thus fatigued, and their swords blunted, the spahis and janissaries may fall on and find an easy conquest. The word is derived from the Turkish *saph*, which signifies rank, from whence they have formed *asaph*, to range in battle

**ASARABACCA** See ASARUM

**ASARUM** (*asarum*, from *a neg*. and *σαφης*, to adorn, because it was not admitted into the ancient coronal wreaths.) Asarabacca: a genus of the class and order dodecandria monogynia. Calyx three-cleft, standing on the germ, corollæ, stamens twelve, capsule coriaceous, six-celled, stigma six-cleft. Three species, one of which, the *a europæum*, is a native of England, but not very common. The leaves of this plant are extremely acrid, and are occasionally used, when powdered, as a sternutatory. The plant was formerly very generally employed internally as well as externally.

## A S B

**ASARUM, HYPOCISTIS.** See CYTISUS.

**ASBAMCEA**, in ancient geography, a fountain dedicated to Jupiter, near Tyana in Cappadocia: its waters, though in a state of apparent ebullition, were cold

**ASBESTINE**, *a* (from *asbestos*) Something incombustible, or that partakes of the nature and qualities of asbestos

**ASBESTOID** See ACTINOTUS

**ASBESTUS.** Asbest in oryctology, a genus of the class earths, order talcose consisting of carbonat of magnesia, silica, and generally alumina, with frequently oxyd of iron; rarely carbonat of lime dry to the touch, fibrous, soft, light, and floating; brittle in the fire, parasitic. Ten species, some with all the fibres parallel, others with the fibres interwoven and breaking into obtuse angled fragments. The following are the chief.

1 **A amiantus** Amiant Flexible asbestos or mountain flax Found with Serpentine in the Ural, Lapland, Swedish, and many European mountains, as also in Candia and China Floating with very fine highly separable fibres

2 **A. maturus** Plumous amiant. Harder, with the fibres more closely cohering, separating rather into a kind of down than distinct fibres. Probably only a variety of a amiantus. Found in Sweden

3 **A fragilis** Glassy asbest or feathered alum shining like glass with separable, very fragile fibres Found in Siberia and Sweden Taken internally highly deleterious, but has been sometimes employed as a stimulant in paralysis and other atonic affections of the nervous system

4. **A vulgaris** Common asbest Found in Siberia, Lapland, Sweden, Silesia, Saxony, Franconia, and Tyrol, generally in wedge-shape pieces

5 **A. suber** Mountain cork. Elastic asbest. Flexible; resembling cork, imbibing water with a noise, adhering to the tongue. Found in the mines of Sweden, Saxony, Hungary, &c containing often silver ores, in thick compact pieces

6. **A lignum.** Mountain-wood ligniform asbest Resembling wood in colour and texture Found at Clansen in Tyrol colour brown, and if broken across discovers an irregular filamentous structure like wood.

7 **A caro** Mountain leather. Found in the iron mines of Sweden, in pieces of the thickness and consistence of tanned horses' skin.

The industry of mankind has devised methods of working the more flexible varieties of this substance, and employing it in divers manufactures, chiefly cloth and paper. Pliny calls the asbestos *invenit rarum, tenui diffusum*, but however this be, Bapt Porta assures us, that in his time the spinning of asbestos was a thing known to every body at Venice, and signior Castagnatta, superintendent of some mines in Italy, is said to have carried the manufacture to such perfection, that his asbestos was soft and tractable, much resembling



lamb-skin dressed white he could thicken and thin it at pleasure, and thus either make it into a very white skin, or a very white paper.

This kind of linen cloth was chiefly esteemed by the ancients, though then better known and more common than among us, being held equally precious with the richest pearls nor is it now of much value, even in the country where it is most generally made, a China cover (i. e. a piece of twenty-three inches and three quarters long) being worth 80 tale, i. e. 30/ 13s 4d. Pliny says, he himself had seen napkins thereof, which, being taken foul from the table after a feast, were thrown into the fire, and by that means were better scoured than if they had been washed in water, &c. But its principal use, according to Pliny, was for the making of shrouds for royal funerals to wrap up the corpse, so that the ashes might be preserved distinct from those of the wood, &c. whether the funeral pile was composed. A handkerchief or pattern of this linen was long since presented to the Royal Society, a foot long, and half a foot broad. This gave two proofs of its resisting fire; though, in both experiments, it lost above three drachms in its weight. When taken out red-hot, it did not burn a piece of white paper, on which it was laid. Mr. Vilette asserts, that his large burning concave usually vitrifies the asbestos.

**ASCALAPHUS**, a tribe of Fabricius. See MYRMELION.

**ASCALON**, an ancient town of Palestine, in Asia, formerly a Bishop's see, but now dwindled almost to nothing. The Turks call it *Sakia*. In the temple of Dereto in this city, Herod, the father of Antipater, and grandfather of Herod the Great, served as priest.

**ASCARIDES**. See ASCARIS.

**ASCARINA**. In botany, a genus of the class and order dioclea, nigandria. Ament. filiform, torulose. Male another worm-shaped (whence its name; see ASCARIS), four-grooved. Four styles. Stigma three-lobed drupe. The only known species is a native of the Society Isles.

**ASCARIS**, (*ascaris*, from *ascis*, to shove about) An intestinal worm so called from its troublesome motion. The *ascaris* in the Linnæan system of zoology is a genus of the class vermes, order intestina - thus generically characterized. Body round, elastic, and tapering towards each extremity. Head with three vesicles, half obtuse or subulate; intestines spiral, tortuous and pellucid. There are eighty species generally deriving their specific name from the country they chiefly infest, - for the genus of most animals is affected by some kind of other. They may be thus subdivided, according to the zoological chain.

At. Infesting the natural class.

1. *ascaris*.

2. *ascaris*.

3. *ascaris*.

4. *ascaris*.

5. *ascaris*.

6. *ascaris*.

7. *ascaris*.

8. *ascaris*.

9. *ascaris*.

10. *ascaris*.

white skin, at the sides of the body, very finely cretate or wrinkled. Inhabit the intestines of children, and thin debilitated adults, principally in the rectum. These worms are generally found in considerable numbers, occasioning troublesome symptoms, and often creeping into the stomach. They are viviparous, and about half an inch long. The female has a small punctiform aperture a little below the head, through which the young are protruded. Head nodose, and divided into three vesicles, in the middle of each of which is an aperture through which it receives nourishment. Body a little dilated in the middle and wrinkled at the sides, pellucid and angular, but gradually tapering and terminating in a fine point, with a small aperture or vent below the middle of the worm. - 2. *A. lumbricoides* long round worm. Head slightly incurved with a transverse contraction beneath it. Mouth triangular. Inhabits the intestines of emaciated persons, generally about the ileum, whence it sometimes ascends into the stomach and creeps out at the mouth or nostrils. Frequently very numerous and vivacious. Length from twelve to fifteen inches, breadth that of a goose quill. Body transparent, light yellow with a faint line down the side. They are oviparous, and distinguished from the lumbricus terrestris or earth worm, in wanting the fleshy ring below the head, and in having three vesicles. The *vespertilionis* a phoece a aquilæ a cygni, &c. from the animal they infest. For the medical treatment of diseases produced by this, and other worms, on the animal frame, see the articles INVERMINATION, and NOSOLOGY.

To ASCEND. *v. n.* (*ascendo*, Latin) 1 To move upward, to mount (*Milton*) 2 To proceed from one degree of good to another (*Watts*) 3 To stand higher in genealogy (*Broome*)

To ASCEND. *v. a.* To climb up any thing (*Delany*)

**ASCENDANT**, in astrology, denotes the horoscope, or the degree of the ecliptic which rises upon the horizon at the time of the birth of any one. Thus, it is pretended, has an influence on the person's life and fortune, by giving him a propensity to one thing more than another.

**ASCENDANT**, denotes 1 Height, elevation (*Temple*) 2 Superiority, influence (*Clar*) 3 One of the degrees of kindred reckoned upward (*Ayliffe*).

**ASCENDANT**. *a.* 1 Superior, predominant, overpowering (*Souls*) 2 In an astrological sense, above the horizon (*Brown*)

**ASCENDENCY**. *a.* (from *ascend*) Influence, power (*Watts*)

**ASCENDING**, in astronomy, is applied to any star, or point of the heavens when rising above the horizon.

**ASCENDING LATITUDE**, is the latitude of a planet when going towards the north pole.

**ASCENDING NODE**, is that point of a planet's orbit, wherein it passes the ecliptic, to proceed northward. This is otherwise called

the northern node, and represented by this character  $\odot$

**ASCENSION** *s* (*ascensio*, Latin) 1. The act of ascending or rising, frequently applied to the visible elevation of our Saviour to heaven (*Milton*) 2 The thing rising or mounting, (*Brown*)

**ASCENSION**, in astronomy, is either right or oblique

*Right Ascension* of the sun, or of a star, is that degree of the equinoctial, accounted from the beginning of Aries, which rises with them, in a right sphere — Or, *Right Ascension* is that point of the equinoctial, counted as before, which comes to the meridian with the sun or star, or other point of the heavens And the reason of thus referring it to the meridian, is, because this is always at right angles to the equinoctial, whereas the horizon is so only in a right or direct sphere To find the right ascension of the sun, stars, &c by trigonometry, say, As radius is to the cosine of the sun's greatest declination, or obliquity of the ecliptic, so is the tangent of the sun's or star's longitude, to the tangent of the right ascension

*Right Ascension of the Mid-heaven*, often used by astronomers, especially in calculating eclipses by means of the nonagesimal degree, is the right ascension of that point of the equator which is in the meridian; and it is equal to the sum of the sun's right ascension and the horary angle reduced to degrees

*Oblique Ascension*, is an arch of the equator intercepted between the first point of Aries, and that point of the equator which rises together with the star, &c in an oblique sphere — The *Oblique Ascension* is counted from west to east, and is greater or less, according to the various obliquity of the sphere

*Ascensional Difference* is the difference between the right and oblique ascension of the same point on the surface of the sphere To find the same ascensional difference trigonometrically, having the latitude of the place, and the sun's declination given, say, As radius is to the tangent of the latitude, so is the tangent of the sun's declination to the sine of the ascensional difference This reduced to time reckoning 15° to an hour, shews how much the sun rises before, or sets after, six o'clock

**ASCENSION** (Isle of,) a dreary desolate island among the African islands situated on the Southern Atlantic ocean S Lat 7 50½ W Lon 14 22½ This island was discovered in 1501, by J de Nova Galea, a Portuguese navigator

**ASCENSION-DAY**, The day on which the ascension of our Saviour is commemorated, commonly called Holy Thursday, the Thursday but one before Whitsuntide

**ASCENSIVE**, *a* (from *ascend*) In a state of ascent not in use (*Brown*)

**ASCENT** *s* (*ascensus* Latin) 1 Rise, the act of rising (*Milton*) 2 The way by which one ascends (*Bacon*). 3 An eminence, or high place (*Addison*)

**ASCENT OF FLUIDS**. See CAPILLARY ACTION

**ASCENT OF VAPOUR**. See EVAPORATION

To **ASCERTAIN** *s*, *a* (*ascertainer*, Fr)

1. To make certain; to fix; to establish (*Locke*) 2 To make confident (*Hammond*)

**ASCERTAINER**, *s* (from *ascertain*)

The person that proves or establishes

**ASCERTAINMENT** *s* (from *ascertain*)

A settled rule; an established standard (*Swift*).

**ASCESIS**, (*ασκησις*), properly denotes exercise of the body But it is used by philosophers to denote an exercise conducive to virtue, or to the acquiring a greater degree of virtue

**ASCETERIUM**, in ecclesiastical writers, is frequently used for a monastery, or place set apart for the exercises of virtue and religion. The word is formed from *asceto*, exercise, or *ascetra*, one who performs exercise. Originally it signified a place where the athletes or gladiators performed their exercises.

**ASCETIC**, an ancient appellation given to such persons as, in the primitive times, devoted themselves more immediately to the exercises of piety and virtue, in a retired life, and particularly to prayer, abstinence, and mortification The word is derived from *ασκησις*, *Exercise* In monkish times this title was bestowed on that order of ecclesiastics, especially upon such of them as lived in solitude

**ASCETIC** is also a title of several books of spiritual exercises, as the *Ascetics*, or devout exercises of St Basil

**ASCHAM** (Roger), a learned English writer, was born at Kirby Whiske, in Yorkshire, about 1515. In 1530, he entered at St John's college, Cambridge, where, in 1534, he took his degree of B A. and was elected fellow In 1536, he was created M.A. and was appointed teacher of Greek in the schools. In 1544, Henry VIII settled a pension of 10*l* a year upon him, and about the same time he was appointed tutor to lady Elizabeth, with whom he read most of Cicero's works, the orations of Isocrates, the plays of Sophocles, and other ancient authors After being employed in this honourable manner two years, he returned to Cambridge, and had a pension settled upon him by king Edward. Here he filled the office of public orator with great reputation In 1550, he attended sir Richard Morcaine, in his embassy to the emperor Charles V. and remained in Germany three years. He died in London in 1568, and was interred in St Sepulchre's church His most esteemed work is entitled, *The Schoolmaster*, or a plain and perfect Way of teaching Children to understand, write, and speak the Latin Tongue, &c. It was first printed in 1571. An excellent edition by Mr. Upton appeared in 1711. Mr. Ascham's Latin epistles have been frequently printed, and are admired by all good judges of elegant composition. His works were printed entire in 4 vol 4to. in 1609.

**ASCIA**, in antiquity, an instrument, supposed to be of the ax kind, used in the labor

of the Roman tombs, and frequently represented upon them.

**ASCIDIA.** In zoology, a genus of the class and order *vermes molusca*. Body fixt, roundish, and apparently issuing from a sheath; apertures two, generally placed near the upper end, one beneath the other. Thirty-five species; almost all of them inhabitants of the European seas and chiefly of the northern, in high latitudes. They adhere by their base to rocks, shells, and other submarine substances, they are more or less gelatinous, and have the power of squirting out the water they take in, some of them are esculent, most of them sessile, though a few are furnished with a long stalk or tubular stem. They contract and dilate themselves alternately.

**ASCII.** 1. It has no singular (*a* and *onia*, shadow). Those people who, at certain times of the year, have no shadow at noon. Such are all the inhabitants of the torrid zone, who have the sun vertical to them twice a year.

**ASCITES**, (*ascites*, from *ασκη*, a sack, or bottle) Dropsy of the belly. A tense, but scarcely elastic, swelling of the abdomen from the accumulation of water. Cullen ranks this genus of disease in the class *cachexia*, and order *intumescencie*. He enumerates two species. 1. *Ascites abdominalis*, when the water is in the cavity of the peritoneum, which is known by the equal swelling of the parietes of the abdomen. 2. *Ascites sacculus*, or encysted dropsy, in which the water is encysted, as in the ovary; the fluctuation is here less evident, and the swelling is at first partial.

**ASCITICAL ASCITICK** *a* (from *ascites*) Dropsical, hydropical (*Fassman*).

**ASCITIOUS** *a* (*ascitius*, Latin) Supplemental; additional (*Pope*).

**ASCUM.** In botany, a genus of the class and order *polyandria monogynia*. Calyx five-leaved, petals five, berry four-celled, with two seeds in each. The only known species is a native tree of Guiana eighty feet high, with violet flowers.

**ASCLEPIAD**, in ancient poetry, a verse composed of four feet, the first of which is a spondee, the second a choriambe, and the two last dactyls or of four feet and a caesura, the first a spondee, the second a dactyl after which follows the caesura, then the two dactyls, as, *Μορμονας αλφεισ εδωκε ροβους*.

**ASCLEPIADES**, one of the most celebrated physicians among the ancients, was a native of Prusa, in Bithynia; and practised physic at Rhodus, under Parnpey, ninety-six years before the Christian era. He was the head of a new sect, and, by making use of wine and cold water in the cure of the sick, acquired a very great reputation. He wrote several books, which are frequently mentioned by Galen, Celsus, and Pliny, but they are now lost.

**ASCLEPIADES**, a famous physician under Adrian, of the same city with the former. He wrote several books concerning the composition of medicines, both internal and external.

**ASCLEPIAS**, (*asclepias*, *adis*, *ασκληπια*, from *Asclepias*, its discoverer, or from *Ἄσκληπιος*, the god of medicine). In botany, swallow-wort, of which some of the species are shrubs and others herbaceous plants, tall, upright, and perennial, with a milky, and very acrid juice, affecting many constitutions with an appearance of being poisoned. The *asclepias* is a genus of the class and order *pentandria digynia*. Corol twisted, nectaries five, ovate, concave, putting out a little horn. Forty-one species, chiefly natives of the Cape or of the East or West Indies. They may be subdivided into those, 1 with opposite flat-leaves, 2 leaves revolute in the margin, 3 alternate leaves. The a nives, of South America, with green corols and snowy nectaries, is the most beautiful. Many of the others, and especially the *vincetoxicum*, have been formerly esteemed in medicine, but have been long growing into disrepute.

**ASCOBOIUS**. In botany, a genus of the class and order *cryptogamia fungi*. Fungus hemispherical, containing oblong vessels, somewhat immersed in its disc, which mechanically eject the seeds. The only known species is the *stercorarius* described by Sowerby.

**ASCORUGA**, in church history, a sect of gnostics, who placed all religion in knowledge; and under pretence of spiritual worship, would admit of no external or corporeal symbol whatever.

**ASCOGYPHYRUS**, in middle age writers denotes a bridge supported on bags made of leather or bullock's hides.

**ASCOLI**, formerly *Asculum* *Apulum*, pretty large town in Italy. Lat 42 24 N Lon 13 29 E.

**ASCOLI DE SATTIANO**, formerly *Asculum Picenum*, an episcopal city of Italy. Lat 41 8 N Lon 15 20 E.

**ASCOLIA**, in Grecian antiquity, a festival celebrated by the Athenian husbands in honour of Bacchus, to whom they sacrificed the goat, because that animal destroys the vines. Out of the victim's skin it was customary to make a bottle, which, being filled with oil and wine, fell as a reward to him who first fixed himself upon it with one foot.

**ASCOPHORA**. In botany, a genus of the class and order *cryptogamia fungi*. Fungus erect on a setaceous stalk, head globular, oblong, infixed, opaque, elastic, bearing the seed externally. Seven species, some clustered on a common convex receptacle, others detached.

**ASCOT HEATH**, a famous race-ground four miles from Windsor, in the road from the Great Park to Reading. Here the king's stag hounds are kept.

**ASCRIBABLE** *a* (from *ascribe*) That may be ascribed (*Boyle*).

**TO ASCRIBE**, *v* *a* (*ascribo*, Latin) 1 To attribute to, as a cause (*Dryden*). 2 To attribute to, as a possessor (*Tillotson*).

**ASCRPTION** *s* (*ascriptio*, Lat) The act of ascribing.

**ASCRIPTITI**, or **ADSCRIPTITI**, well

## A S H

description of villains, who, coming from abroad, settled in the lands of some new lord, whose servants or subjects they became, being annexed to the lands, and like other villains transferred and sold with him.

**ASCRIPITIOUS** *a* (*ascripitius*, Lat.) That is ascribed

**ASCUS**, in natural history, the folliculus, abdominal pouch, or receptacle, with which nature has furnished animals of the opossum tribe

**ASCYRUM** St Peter's wort a genus of the class and order polyadelphia polyandria, Calyx four-leaved, petals four, filaments numerous, disposed in four sets Five species, natives of the West Indies or North America

**ASDRUBAL**, a Carthaginian, son-in-law of Hamilcar He distinguished himself in the Numidian war, and was appointed chief general on the death of his father-in-law, and for eight years presided with much prudence and valour over Spain, which submitted to him with cheerfulness Here he laid the foundation of new Carthage, and saw it complete He was killed in the midst of his soldiers, B C 220, by a slave whose master he had murdered Ital Polyb — 2 A son of Hamilcar, who came from Spain with a large reinforcement for his brother Annibal He crossed the Alps, and entered Italy; but some of his letters to Annibal having fallen into the hands of the Romans, the consuls M Iulius Sulpinator, and Claudius Nero, attacked him suddenly near the Metaurus, and defeated him, B C 207 He was killed in the battle, and 60,000 of his men shared his fate, and 5400 taken prisoners, about 8000 Romans were killed The head of Asdrubal was cut off, and some days after thrown into the camp of Annibal, who, in the moment that he was in the greatest expectations for a promised supply, exclaimed at the sight, "In losing Asdrubal, I lose all my happiness, and all glories all her hopes."—There were many other famous Carthaginians of this name, whose history is blended with that of the Romans,

**ASHKI**, or **ASHKAI**, the name which the Turks gave to the favourite sultaneesses who have brought forth sons These are greatly distinguished above others in their apartments, attendants, pensions, and honours, and have even sometimes shared the government.

**ASELLI**, a name given to two small stars in Cancer

**ASELLII PANCREAS** See **PANCREAS**  
**ASH** *s* (*ærc*, Saxon,) A tree See **FRAXINUS**

**ASH MOUNTAIN** See **SORBUS**.

**ASH POISON** See **RHUS**

**ASHBORN**, a town in Derbyshire, with a market on Saturdays. Lat 53 3 N Lon. 1. 44 W

**ASHBURTON**, a town in Devonshire, having markets on Tuesdays and Saturdays Lat 50 30 N Lon. 3 50 W

**ASHBY DE LA ZOUCH**, a town in Leicestershire, with a market on Saturdays Lat 52 42 N Lon 1 25 W.

## A. & H

**ASH COLOURED** *a* (from *ash* and *colour*.) Coloured between brown and grey (*Wood*.)

**ASHAMED**. *a* (from *shame*.) Touched with shame (*Taylor*.)

**ASHEN**, *a*. (from *ash*.) Made of ash wood (*Dryden*)

**ASHES** *s* wants the singular (*Æra*, Saxon) 1 The remains of any thing burnt (*Digby*), 2 The remains of the body (*Pope*)

**ASHES** This term, though it formerly extended to the product of metallic bodies after combustion, is now properly confined to the pulverulent remains of vegetable and animal matters after burning The ashes thus produced, when considered chemically, are found to contain a large proportion of the saline ingredient which yield those very important articles, the fixed alkalis, both vegetable and mineral—the former distinguished according to its species and purity by the terms wood-ashes, pearl-ash, potash of commerce, salt of tartar, or salt of wormwood, the latter by the terms natron, barilla, kelp, and soda. When the saline part of vegetable ashes has been separated by lixiviation, the light earth that remains is sometimes employed in the formation of the large cupels used in the refining of silver The analysis of vegetable ashes has discovered in them silex, magnesia, lime, potash, soda; the sulphuric, carbonic, phosphoric, and muriatic acids; and the oxides of iron and manganese

Animal matter is much more difficult of combustion than vegetable The saline and earthy parts almost peculiar to animal ashes are the phosphates of soda, of ammonia, and of lime, and often the carbonates of soda and of lime The animal matters from which ashes are produced are chiefly bone, horn, and shells The ashes from bones when lixiviated, mixed with water, and cast in proper moulds, form the cupels that are employed in assaying and refining gold and silver

Ashes of all kinds contain an alkaline salt, and are an excellent manure for cold and wet ground They are also of considerable use in making lixiviums or lyes, for the purposes of medicine, bleaching, and for sugar works

**ASHFORD**, a town in Kent, with a market on Saturdays. Lat 51 4 N Lon. 0 50 E

**ASHKOKO**, in zoology See **HYRAX**  
**STRYACUS**, and **BRYLLI GAVY**

**ASHLAR**. *s*. (with masons.) Freestone as it comes out of the quarry

**ASHLERING** *s* (with builders) Quartering in galleys *Barber's Diet*

**ASHMOLE** (Elias), a great antiquary and herald, founder of the Ashmolean museum at Oxford, was born at Lichfield in Staffordshire, 1617 In the early part of his life he practised in the law; and in the civil war had a captain's commission under the king and was also comptroller of the ordnance He married the lady Maitwaring in 1649, and settled at London, where his house was frequented by all the learned and ingenious men of the time Mr Ashmole was a diligent and curious collector of manuscripts In the year 1650 he published

a treatise written by Dr Arthur Dee, relating to the philosopher's stone, together with another tract on the same subject, by an unknown author. About the same time, he was busied in preparing for the press a complete collection of the works of such English chemists as had left their remains in manuscript. Thus undertaking cost him great labour and expence; and at length the work appeared, towards the close of the year 1662. He proposed at first to have carried it out to several volumes, but he afterwards dropped his design, and seemed to take a different turn in his studies. He now applied himself to the study of antiquity and records; he was at great pains to trace the Roman road, which in Antoninus's Itinerary is called Ben-nevanna, from Weedon to Litchfield, of which he gave Mr Dugdale an account in a letter. In 1668 he began to collect materials for his history of the Order of the Garter, which he lived to finish, and thereby did no less honour to the order than to himself. In September following, he made a journey to Oxford, where he set about giving a full and particular description of the coins presented to the public library by archbishop Laud.

Upon the restoration of king Charles II Mr Ashmole was introduced to his majesty, who received him very graciously, and on the 18th of June, 1660, bestowed on him the place of Windsor herald. A few days after, he appointed him to give a description of his medals, which were accordingly delivered into his possession, and king Henry VIII a closet was assigned for his use. On the 15th of February, Mr Ashmole was admitted a fellow of the Royal Society, and, on the 9th of February following, the king appointed him secretary of Surinam, in the West Indies. On the 19th of July, 1699, the university of Oxford, in consideration of the many favours they had received from Mr. Ashmole, created him doctor of physic by diploma, which was presented to him by Dr Yates, principal of Brazen Nose college. On the 6th of May, 1672, he presented his "Institution, Laws, and Ceremonies, of the most noble Order of the Garter," to the king, who received it very graciously, and, as a mark of his approbation, granted him a privy seal for 400*l.* out of the custom of paper. On the 26th of January, 1679, a fire broke out in the Middle Temple, in the next chamber to Mr Ashmole's, by which he lost a noble library, with a collection of 9000 coins, ancient and modern, and a vast repository of seals, charters, and other antiquities and curiosities, but his manuscripts and his most valuable gold medals were safely at his house at Lambeth. In 1681, the university of Oxford having finished a magnificent repository near the theatre, Mr Ashmole sent thither his curious collection of rarities, which benefaction was considerably augmented by the addition of his manuscripts and library at his death, which happened at Lambeth, the 18th of May, in the 90th year of his age. He was interred in the church of Queen Lambeth in Surry, on the 28th of

May, 1699, and a black marble stone laid over his grave, with a Latin inscription.

Besides the works which we have mentioned, Mr Ashmole left several which were published since his death, and some which remain still in manuscript.

**ASHORE** *a* (from *a* and *shore*) 1 On shore; on the land (*Raleigh*) 2 To the shore, to the land (*Milton*).

**ASH-WEDNESDAY**, the first day of Lent, supposed to have been so called from a custom in the church, of sprinkling ashes that day on the heads of penitents then admitted to penance. See *LENT*.

**ASHWEED** *s* (from *ash* and *weed*) An herb. **ASHY** *a* (from *ash*) Ash-coloured, pale, inclining to a whitish gray (*Shakspeare*).

**ASIA**, in geography, one of the four grand divisions, called quarters, of the earth, and inferior in size only to America, surpassing in extent Europe and Africa taken together, lies to the east of Europe. It was so called, if we are to believe the Greeks, curious in searching after the etymology of words, from Asia, daughter of Oceanus and Thetis, others say that it derived its name from Asius, the son of Atys, king of Lydia while Bochart is of opinion, that it took its name from the Phœnician word *As*, signifying the middle, but all this is mere conjecture. It was in Asia, according to the sacred records, that the all-wise Creator planted the garden of Eden, in which he formed the first man and the first woman, from whom all mankind were to spring. Asia became the nursery of the world after the deluge, whence the descendants of Noah dispersed their various colonies into the other parts of the globe. It was in Asia that God placed his once favourite people, the Hebrews, whom he enlightened by revelations delivered by the prophets, and to whom he gave the oracles of truth. It was here that the great and merciful work of our redemption was accomplished by his divine Son, and it was from hence that the light of his glorious Gospel was carried, with amazing rapidity, into all the known nations of the earth, by his disciples and followers. Many of the greatest empires have been established in this part of the world: first, the empire of the Chaldeans or Assyrians, then that of the Medes, founded by Arbaces, which ended in Astyages; from whom it was removed to the Persians by Cyrus, until the death of Darius; then to the Greeks or Macedonians, under Alexander the Great, after him the Parthians, the Persians, the Turks and Saracens, and the Moguls have each been powerful. At present it is divided into seven principal parts, Asiatic Turkey, Arabia, Persia, India, China, Tartary, and Siberia, to which may be added, a great number of islands. Asia is bounded on the north by the Frozen Sea, on the east by the North Pacific Ocean and the sea of China, on the south by the Indian and Arabian Seas, on the west it is separated from Africa by the Red Sea, and the Isthmus of Suez, and from Europe by the Archipelago,



the Straits of Gallipoli, the Sea of Marmora, the Straits of Constantinople, the Black Sea, and from thence by an imaginary line to the Frozen Ocean, between 60 and 70 degrees of E Lon from London. Its supposed extent is about 1600 leagues from the Straits of Gallipoli in the west, to the eastern shore of Tartary, and near 1500 from the southern extremity of Malacca, to the Frozen Ocean. There must be a great variety of climates in a country of so vast an extent, as well as soil and produce; yet on the whole, if we except part of Arabia and Tartary, and some of the more northern tracts, it is in general rich and fruitful, and some parts of it exceedingly so.

The principal religions of Asia are, the Christian, the Mahomedan, the Pagan, and that of Confucius. The Christian religion is professed in some parts of Asiatic Turkey, part of Little Tartary, the north-west part of Persia, and by the Russians in Siberia. The Mahomedan is established in Arabia, Persia, Little Tartary, Bukaria, and the Mogul's empire. The Pagan religion, wherein the worship of the Deity is mixt with that of idols, is professed by the bulk of the inhabitants of the Mogul's empire, in both the Peninsulas of India, in China and Siberia, in the islands of Asia, in all Western Tartary, in Tibet, and in all the countries between India and China. The religion of Confucius is established in China.

The languages of Asia are very numerous, and therefore we shall only mention the chief. The principal of Turkey in Europe are, the Grecian and Turkish, the Armenian is spoken in part of Turkey in Asia, and Persian, the Arabic is the only tongue in Arabia, and is spread over part of Turkey in Asia, as a learned language. The Persian is used in Persia, and the court of the great mogul. The Indian is spoken in India, by the ancient inhabitants of that country. The Malayan language is common on the coast of India, and in some of the islands. The Siamese in Siam, the Tibetan in Tibet, the Manchew in China and Eastern Tartary, and the Tartarian in Great Tartary. Besides these, there are several distinct languages in Siberia, and the islands of Asia.

The principal rivers of Asia are, the Euphrates and Tigris, in Turkey, the Indus and Ganges, in India, the Kiang and Hoang-ho, in China, the Sir Amu and Wolga, in Western Tartary, the Saghalia Ula or Amur, in Eastern Tartary, the Irtysh, Obi, Jenisea, and Lena, in Siberia. The lakes are, that prodigious one called the Caspian Sea, and near that another very large one, called the lake Aral. The Baykal is in Siberia, the Kokonor near Tibet, and the Tong Ping in China. The chief mountains are, the Taurus in Turkey and Persia, the Imaus between India and Tibet, and the Altay, in Tartary.

The Asiatic islands are very numerous, some reckoning one hundred and fifty thousand; but of this there is no certainty. Those that lie on the east of Asia are, the islands of Jesso or Yedso, and Japan, with several small ones on the coast of Korea, the island of Formosa,

and the Philippines. Those on the west are, the island of Cyprus, in the Mediterranean; Scanderoon, off Naxos, and the Isle of Rhodes, off Phischo, on the same coast. Those on the south are, the isles of the Maldives, in the Indian Sea, the Isle of Ceylon, off Cape Komorin, with a great many small ones in the gulf of Bengal. Those on the south-east are, the isles of Sandi, or Sumatra, the isles of Java, Borneo, &c.

ASIA MINOR. See NATOLIA.

ASIA PROCONSULAR, so called because it was governed by a proconsul, comprehended, according to Augustus's distribution, of the provinces of the Roman empire, Lydia, Ionia, Caria, Mysia, Phrygia, and the proconsular Hellespont.

ASIA, in mythology, was one of the nymphs called Oceanides, and according to Diodorus, the wife of Japetus.

ASIATIC, in a general sense, any person of thing that bears relation to Asia.

ASIATICA, in entomology, a species of chrysomela, found in Siberia.

ASIDE *ad.* (from *a* and *side*.) 1. To one side (*Dryden*). 2. To another part (*Adon*). 3. From the company (*Mark*).

ASIDE, in the drama, something said by an actor, which some, or even all the other actors present, are supposed not to hear, a circumstance justly condemned as being unnatural and improbable.

ASILUS, in zoology, a genus of the class insecta, order diptera. Mouth with a horny projecting, straight, two-valved sucker, gibbous at the base, antennae filiform approximate, of two articulations: body oblong, conic. Seventy-three species, scattered over the globe; which prey on other insects, especially those of the dipterous and lepidopterous orders.

ASINARI, an appellation given, by way of reproach, to the ancient Christians, as well as Jews, from a mistaken opinion, among heathens, that they worshipped an ass. The appellation was originally given to the Jews; and only became applied to the Christians.

ASINARY, *a* (*asinarius*, Lat.) Belonging to an ass.

ASININE *a*. (from *asinus*, Lat.) Belonging to an ass (*Milton*).

ASINUS, in zoology, (see *Equus*.) Under which at ranks as a species, viz. *a. asiaticus*.

ASITIA, (*ασημία*, from *ασημ* and *ασημία*.) Loss of appetite, Wanting of food.

To ASK, *v. a* (*arcere*, Saxon.) 1. To petition, to beg (*Swift*). 2. To demand, to claim (*Dryden*). 3. To inquire, to question (*Jeremiah*). 4. To require, as needful (*Job*).

ASKANCE, ASKANCE, *ad.* Sideways, obliquely (*Milton*).

ASKAUNT *ad.* Obliquely; on the side (*Dryden*).

ASKER, (from *ask*.) 1. Pentagon (*Newton*). 2. Inquirer (*Digby*).

ASKER, *a*. A water neut.

ASKEW *ad.* (from *a* and *skew*.) Aside; with contempt, contemptuously (*Prior*).

ASKETON, a market-town, and, until

the union, a borough town of Ireland, lying in the county of Limerick, on the river Deel. It is famous for its castle and beautiful abbey. Lat. 44. 54 N. Lon. 8. 54 W.

**ASKRIG**, a town in the N riding of Yorkshire, with a market on Thursdays. Lat. 54 N Lon 1 0 W.

**ASLAKK** *v a* (from *a* and *slake*, or *slack*). To rest; to slacken obsolete (*Sp*).  
**ASLANI**, a name given to the Dutch dollar current in the Levant. Its value is about 120 aspara.

**ASLANT**, *ad.* (from *a* and *slant*.) Obliquely, on one side (*Dryden*).

**ASLE/EP** *a* (from *a*, and *sleep*.) 1 Sleeping, at rest (*Dryden*). 2 To sleep (*Milton*).

**ASLOPE** *ad.* (from *a* and *slope*.) With declivity, obliquely (*Bacon*).

**ASMONKEANS**, in ancient history, the Maccabees.

**ASNA**, a town of Upper Egypt, seated on the river Nile, near the cataracts. The inhabitants, who are Arabs, carry on a considerable trade with the people of Nubia by means of the Nile, and the caravans that pass over the deserts. Lat 24. 45 N Lon 31 40 E.

**ASOPII**, a town of Coban Tartary, in Asia, seated on the river Don. N. lat 47. 18 E Lon 41 30.

**ASOPUS**, a town of Laconia, in which was a temple of Minerva Cyparissensis, southeast of Cyparissa.

**ASP**, or **Aspic**, in zoology, a species of **COLUMBAR**, which see.

**ASP**, or **ASPER TREE**. See **POPULUS**.

**ASPALATHI LIGNUM** See **LIGNUM ALOES**.

**ASPALATHUS**, African-broom, a genus of the class and order diadelphia, decandria. Calyx five-cleft, the upper division larger, legumina coated, downless, one or two-seeded. Sixty species, all natives of the Cape, except the *a. orientalis* and *a. arborea*, the former of which is common to the East, and the latter a tree of Cochinchina, with weak, reclining branches and white flowers.

**ASPALAK**, a species of mus, called by Pohnant the Daurian rat. Dr. Shaw says it agrees in form and manners with the mus Talpinus, or blind rat.

**ASPALTUM**. See **ASPHALTUM**.

**ASPARAGIN**, a name given to a lately discovered juice of asparagus, which was discovered by expression and evaporation. Various crystals gradually make their appearance, and among others crystals of asparagin easily separated from the rest on account of their colour and figure. The crystals are white and transparent, and have the figure of rhomboidal prisms: it is hard and brittle, and its taste is cool and slightly nauseous, as as to occasion a secretion of saliva. It dissolves in hot water, but not in alcohol. The aqueous solution does not affect vegetable blues. Neither infusion of galls, acetate of lead, oxide of ammonia, nitrous ether, nor the hydrosulphuric acid, occasion any change in it. When triturated

heated it exhales, and emits penetrating vapours, affecting the eyes and nose like the smoke of wood. Nitric acid dissolves it with the evolution of nitrous gas. These properties distinguish it from all other vegetable substances.

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**ASPARAGUS**, The first tender sprout, or young shoot of an herb from the ground, before any leaves unfold themselves (*Ray*).

**ASPARAGUS**, (*ασπαργος*, a young shoot with unfolded leaflets.) Spérage: a genus of the class and order hexandria monogynia. Corol six-cleft, erect, equal, calyxless, style very short, three-cleft, berry superior, thick-celled, with two seeds in each. Twenty species, natives chiefly of the south of Europe, the Cape and East Indies. The *a. officinalis* is the only native of our own country: it is found wild on our coasts, and is cultivated with much improvement in our gardens, which also exhibit many of the other species.

**ASPARAGUS** (Climbing African) See **MYDEOLA**.

**ASPASIA**, a daughter of Hermotimus of Phocæa, famous for her personal charms and elegance. She was priestess of the sun, mistress to Cyrus, and afterwards to his brother Artaxerxes, from whom she passed to Darius. She was called Mito, Vermilion, on account of the beauty of her complexion (*Asian*). Another woman, daughter of Axiochus, born at Miletus. She came to Athens, where she taught eloquence, Socrates was proud to be among her scholars. She so captivated Pericles by her mental and personal accomplishments, that he became her pupil, and at last took her for his mistress and wife. He was so fond of her, that he made war against Xerxes at her instigation (*Plut*).

**ASPASTICUM** (from *ασπαστειν*, *I salute*). In ecclesiastical writers, a place, or apartment, adjoining to the ancient churches, wherein the bishop and presbyters sat, to receive the salutations of the persons who came to visit them, desire their blessing, or consult them on business.

**ASPECT** *s* (*aspectus*, Lat.) 1 Look, air, appearance (*Burnet*). 2 Countenance, look (*Pope*). 3 Glance, view, act of beholding (*Milton*). 4 Direction toward any point, position (*Sw*). 5 Disposition of any thing to something else, relation (*Locke*).

**ASPECT**, in astronomy, denotes the situation of the planets and stars with respect to each other. There are five different aspects. 1 Sextile aspect is when the planets or stars are 60° distant, and marked thus ♌. 2 The quartile, or quadrata, when they are 90° distant, marked □. 3 Trine, when 120° distant, marked Δ. 4 Opposition, when 180° distant, marked ♌. And, 5 Conjunction, when both in the same degree, marked ☿. Kepler, who added eight new ones, defines aspect to be the angle formed by the rays of two stars meeting on the earth, whereby their good or bad influence is measured, for it is to be observed, that these aspects being first



## ASP

introduced by astrologers, were distinguished into benign, malignant, and indifferent; the quartile and opposition being accounted malign, the trine and sextile, benign or friendly; and the conjunction, indifferent.

**ASPECT** (double), in painting, is used where a single figure is so contrived, as to represent two or more different objects, either by changing the position of the eye, or by means of angular glasses.

**ASPECT**, in a military sense, is the view or profile of land or coast, and contains the figure or representation of the borders of any particular part of the sea. These figures and representations may be found in all the ruttiers or directories for the sea-coast. The Italians call them *demonstrations*. By means of this knowledge you may ascertain whether the land round the shore is high, if the coast itself is steep or sloping, bent in the form of an arc, or extended in straight lines, round at the top, or rising to a point. Every thing, in a word, is brought in a correct state before the eye, as far as regards harbours, bays, gulphs, adjacent churches, trees, windmills, &c.

**ASPECT** (menacing). An army is said to hold a menacing aspect, when by advanced movements or positions it gives the opposing enemy cause to apprehend offensive operations.

**ASPECT** (military). A country is said to have a military aspect, when its general situation presents appropriate obstacles or facilities for an army acting on the offensive or defensive.

**ASPECT** (imposing). An army is said to have an imposing aspect, when it appears stronger than it really is. This appearance is often assumed for the purpose of deceiving an enemy, and may not improperly be considered as a principal point in war.

**To ASPIRE** *v a* (*aspiro*, Lat.) To behold, not used (*Trumble*).

**ASPECTABLE** *a* (*aspectabilis*, Lat.) Visible, being the object of sight (*Ray*).

**ASPECTION** *s* (from *aspect*) Beholding, view (*Bacon*).

**ASPEN**, or **ASP** *s* (*erpe*, Saxon.) A tree, the leaves of which always tremble (*Spenser*). See **POPULUS**.

**ASPEN** *a* (from *asp* or *aspen*) 1 Belonging to the asp-tree (*Gay*) 2 Made of aspen wood.

**ASPER**, a small Turkish silver coin, value about  $\frac{1}{4}$ d English.

**ASPER** *a* (Lat.) Rough, rugged (*Bacon*).

**ASPER**, in grammar, an accent peculiar to the Greek language, marked thus ( ` ), and importing, that the letters over which it is placed ought to be strongly aspirated, or pronounced as if an *h* were joined with them.

It is very doubtful whether this aspiration was in use in the time of the Apostles; and it becomes much more doubtful when we consider, that the most ancient versions of the New Testament so frequently confound *aspe* with *aspe*, that both words seem to have been written without an *asper*. See Marsh's *Mishnah*, vol. ii p 522. See also **ASPERA RE**.

## ASP

**ASPERA ARTERIA**. See **TRACHEA**.  
**To ASPERATE** *v a* (*aspero*, Lat.) To make rough or uneven (*Boyle*).

**ASPERATION** *s* (from *asperare*) A making rough.

**ASPERGILLUM**, in antiquity, a long horse-hair brush, fixed to a handle, wherewith the lustral water was sprinkled on the people.

**ASPERIFOLIAE** (rough-leaved). The name of the 43d order in *Leontius's* *Fragmenta*, and of the 41st in his *Ordines Naturales*. Ray and others have the same natural order.

**ASPERIFOLIUS** *a* (*asper* and *folium*, Lat.) Plants so called from the roughness of their leaves.

**ASPERITY** *s* (*asperitas*, Lat.) 1. Unevenness, roughness of surface (*Boyle*) 2 Roughness of sound 3 Roughness or ruggedness of temper, moroseness, sourness (*Rogers*).

**ASPERNATION** *s* (*aspernatio*, Lat.) Neglect, disregard.

**ASPEROUS** *a*, (*asper*, Lat.) Rough; uneven (*Boyle*).

**To ASPERSE** *v a* (*aspergo*, Lat.) To bespatter with censure or calumny (*Swift*).

**ASPERSION** *s* (*aspersio*, Lat.) 1 A sprinkling (*Shakspeare*) 2 Calumny; censure (*Dryden*).

**ASPERUGO**. Wild bugloss, goose-grass, or madwort, a genus of the class and order pentandria, monogynia. Calyx of the fruit compressed, its two margins flat, and parallel, sinuate. Two species, a procumbens, common to our own wastes, and a *egyptiaca*, a native of Egypt.

**ASPERULA**. Woodroof, a genus of the class and order tetrandria, monogynia. Corolla one-petalled, tunnel form. seeds two globular. Eleven species, chiefly of European birth, and two natives of our own country, an *odorata*, found in our woods, and a *cyanachica*, on the dry sunny banks of our fields. *Asperula odorata* is the systematic name for the official matrisylvia. See **MATRISYLVA**.

**ASPHALITES**, in anatomy, the fifth vertebra of the loins. It is thus called because it is thought to be the support of the whole spine of the loins, being derived from the privative *a* and *σπῆλαια*, *I supplant*.

**ASPHALT**. See **BITUMEN**.

**ASPHALTICK** *a* (from *asphaltos*) Gummy, bituminous (*Milton*).

**ASPHALTITES**, so called from the great quantity of bitumen it produces, called also the *Dead Sea*, and from its situation, the *East Sea*, the *Salt Sea*, the *Sea of Sodom*, the *Sea of the Desert*, and the *Sea of the Plain*, by the sacred writings; a lake of Judaea. A part of this lake was formerly the vale of Siddim, on which stood Sodom, Gomorrah, &c. It abounds with bituminous substances. See *Wells's Geography*, vol. 2 p 145.

**ASPHALTUS**, **ASPHALTUM** (*ασφαλτος*, from *σπῆλαια*, a lake in Judaea, where it was produced) Jews pitch, or bitumen of Judaea, called also *funeral gum*, *amber of Sodom*, *mineral pitch*, &c. It is a black bituminous sub-

stank, ponderous, solid, and considerably brilliant. It breaks easily, and its fracture is vitreous. When a thin plate of it is held between the eye and the light, it appears red. It has no smell when cold, and but a faint one when rubbed. It is found on the waters of the lake Asphaltites, or the Dead Sea, in Judæa, near which stood the ancient cities of Sodom and Gomorrah, and the inhabitants of the neighbourhood collect it for sale. Many lakes in China afford this mineral.

The origin of asphaltus, like that of the other bitumens, is uncertain, various opinions have been entertained on the subject, and among the rest, that this bitumen is nothing but amber altered by subterraneous fire. The analogy of these two substances is, however, by no means determined.

Asphaltus, when exposed to fire, becomes liquid, swells, and burns with a thick flame and smoke, the smell of which is strong, acrid, and disagreeable. By distillation, it affords a coloured oil, and an acid phlegm. It is used by the Arabians and Indians in the same manner as pitch for coating their vessels, and by the Chinese for varnishes. For the purposes of sale it is sometimes mixed with pitch, but the fraud may be detected by means of alcohol, which dissolves the pitch, but produces no change on the asphaltus. See BITUMEN.

ASPHODEL. See ASPHODELUS.

ASPHODEL (African) See AUTHERICUM.

ASPHODEL (lily) See HEMEROCALLIS.

ASPHODEL (lily) See C. RINUM.

ASPHODELUS (*Asphodelus, ασφodelos*, from *ασπις*, a serpent, and *δολος*, fearful, because it destroys the venom of serpents or from *ασπιδος*, shields; because it was formerly sown upon the graves of the dead). Daffodil. Asphodel, or King's spear, a genus of the class and order hexandria, monogynia. Coral six-parted, nectary consisting of six valves covering the germ. Several species, all of European origin and chiefly of warm climates. Asphodelus racemosus; cane nudo, foliis ensiformibus carinatis herbis, of Linnæus, was formerly supposed to be efficacious in the cure of sordid ulcers. It is now wholly laid aside.

ASPHODELUS RACEMOSUS. The systematic name for the officinal asphodelus. See ASPHODELUS.

ASPHYXIA. (*asphyxia, ασφυξια*, from *α*, priv., and *σφυξια*, a pulse.) The state of the body during life, in which the pulsation of the heart and arteries cannot be perceived. There are several species of asphyxia enumerated by different authors.

ASPIDIUM, in botany, a genus of the class and order cryptogamia, filices. Fructification in roundish scattered dark, very marginal, imbricated umbellules opening steadily all round. Several species of this fern, which may be distinguished thus:

1 simple or trifoliate frond  
the frond

with fronds or triply pinnate.  
in ancient geography, a powerful

people of India; whom Alexander defeated in a pitched battle near the river Eccaspla.

ASPIRATH, ASPIRATIO, in grammar, a character used to denote an aspiration.

The *aspirate*, by the Greeks called *spiritus asper*, and marked over their vowels, seems to be of a very different nature from the letters, but is nevertheless a true letter, as well as the rest, and a real consonant. — By letters we do not mean the characters of the alphabet, which are changeable according to the languages and the people, and among the same people, according to time and custom, and even according to the fancy of particular persons. Thus, some, for instance, write the aspirates, or letters aspirated, which by others are omitted, though both the one and the other pronounce alike as in *huomo*, *huomini*, an Italian word frequently written *uomo*, *uomini*. But, by letters, we here mean articulate sounds, marked by them, and formed by the organs of speech, viz the throat, mouth, tongue, palate, teeth, &c.

Now an aspirate is an effect or consequence of a motion made by some of the organs of speech, and therefore it must either be a vowel or a consonant. The former it cannot be, as not being a simple sound, or a sound that may be pronounced by itself. It must therefore be a modificative, or consonant, and in effect it has all the properties of one.

For, 1<sup>st</sup> It results from a motion of the organ, which, of itself, produces no sound. Thus the *spiritus* of the Greeks, pur *h aspirate*, as well as that of the French, and other people, is no more sound of itself, than *f*, *c*, *d*, &c. and the same thing may be observed of the *aleph*, *beth*, and *caph*, of the eastern languages.

2<sup>dly</sup> On the contrary, our *h*, the *spiritus* of the Greeks, and the other aspirates just mentioned, are pronounced with all the vowels, in the same manner as consonants are. They modify those vowels, and are effects of a motion of the organ superadded to the motion necessary to form the vowel. Thus, to pronounce *ha*, two operations of the organ are required as well as for *ba*, or *ca*, &c.; one for *a*, which itself is a sound, the other for *h*, which yields no sound, no more than *b*, but adds something to *a* which modifies it, and makes that *ha* is not mere *a*, nor *ba*, nor *ca*, &c. And this must hold still more sensibly in the stronger aspirates, as those of the oriental tongues *h, th, v, y, w, z, c*, &c. in all which, there are evidently two motions, the one to express the vowel, and the other to modify it: now this being the nature and essence of a consonant, it follows, that let them be denoted in what manner they will, whether as our *h*, as the orientals do, i. e. by proper characters in the course of the words themselves, or, as the Greeks do some of theirs, by a sign of aspiration placed over the vowel, it matters not. The aspirate is no less a consonant in *dis*, than in *χρυσος* in *σω*, than in *χλω*; in *δω*, than in *δωκ*, and so of others.

The third and last reason urged by some, is,

that the eastern languages, which, according to them, do not express the vowels, do yet express the aspirates. This kind of argument seems, however, to be grounded on a mistake, since it is more than probable, that the *h*, *r*, *v*, *y* of those languages should be ranked among the vowels, and were so used.

Add, that the aspirate is frequently changed into a consonant, and expressed by a consonant. Thus, of *se* is made *ser*, of *septem*, of *vesper*, *vesperus*, &c. of the Hebrew *ayin*, and thence *inum*, &c. Nay, even in the same language, Hesiod, speaking of Hercules's buckler, uses *hērōn* for *ōpērōn*, making no difference between *i* and an aspirate.

Hence it follows, that aspirates are real consonants, and that we ought not to exclude the *h* in our language out of the number of letters.

To A'SPIRAT *v* *a* (*aspiro*, Lat.) To pronounce with aspiration, or full breath.

To A'SPIRATE *v* *u* To be pronounced with full breath (*Dryden*).

ASPIRATE *a* (*aspiratus*, Lat.) Pronounced with full breath (*Holder*).

ASPIRATION *s* (*aspiratio*, Lat.) 1. A breathing after; an ardent wish (*Watts*). 2. The act of aspiring, or desiring something high and great (*Shakespeare*).

ASPIRATION, the act of aspiring, *i* e. of pronouncing any syllable, or word, strongly, with a good deal of breath and vehemence.

This we do, for instance, in those words which have the letter *h* before them, as *harangue*, *hook*, *Holland*, *hero*, &c.; whereas the like syllables are sounded much softer and easier without the *h*, as in the words *ear*, *eat*, &c. See *H*.

To ASPIRE *v* *n* (*aspiro*, Lat.) 1. To desire with eagerness, to pant after something higher (*Davies*). 2. To rise high (*Waller*).

ASPIRE, *s* (from *aspire*) One who ambitiously strives to be greater than he is (*Milton*).

ASPLEN'NIUM Spleenwort, or malt-waste, a genus of the class and order cryptogamia, filices. Fructification in straight scattered lines, involucre originating laterally from a vein opening towards the tip. Of this fern there are fifty-nine species, which may be subdivided into those,

- A. with undivided frond,
- B. frond divided
- C. pinnatifid
- D. pinnate
- E. doubly pinnate.

ASPLEN'NIUM RUTA MURARIA The systematic name for the ruta muraria of the pharmacopœias. See RUTA MURARIA.

ASPLEN'NIUM SCOLOPENDRIUM The systematic name for the scolopendrium of the pharmacopœias. See SCOLOPENDRIUM.

ASPLEN'NIUM TRICHOMANES The systematic name for the trichomanes of the pharmacopœias. See TRICHOMANES.

ASPORTATION *s* (*asportatio*, Latin) A carrying away.

ASPRONISI, a small island in the harbour of Megali Camoi, on the island of Santorin,

in the Mediterranean. It rose out of the sea in the first century after the birth of Christ.

ASQUINT *s* (from *a* and *square*) Obliquely, not in the straight line of vision (*Sneyd*).

ASS, in zoology, a species of equus. See ASINUS, and EQUUS.

Coronation of the ASS, in antiquity, was a part of the ceremony of the feast of Vesta, wherein the bakera put bread-crowns on the heads of those quadrupeds; *Ecce coronatus pennis dependet asellis*. Hence, in an ancient calendar, the ides of June are thus denoted; *Festum est Vestæ Assus coronatus*. This honour, it seems, was done the beast, because, by its braying, it had saved Vesta from being ravished by the Lampsacan god. Hence this formula, *Vestæ delictum est asinus*.

ASS, feast of, a festival, celebrated during the dark ages, in commemoration of the Virgin Mary's flight. On this occasion, a young girl, richly dressed, with a child in her arms, was set upon an ass. The beast was led to the altar, where mass was said with great pomp. The ass was taught to kneel, and a hymn was sung in his praise. As soon as the ceremony was ended, the priest and the people brayed in imitation of the ass. This was esteemed an act of devotion, and performed by authority of the church.

ASSA See ASA.

ASSAC, (*Asao*, Arab.) Gum-ammoniac.

ASSAD, the name given by some Arabic writers to the lion.

ASSA-FETIDA. See ASA-FETIDA.

ASSAI, in music, is always joined with some other word, to lessen or weaken its signification, for example, if it be added to any of the words, Adagio, Grave, or Largo, which all denote a slow movement, it signifies that the music must be performed not so slow as each of these words would require if alone; but if it be joined with any of these words, Vivace, Allegro, or Presto, which all denote a quick movement, then it signifies that the music must not be performed quite so brisk or quick as each of these words would require if alone.

To ASSAIL *v* *a*. (*assail*, French.) 1. To attack in a hostile manner, to assault; to fall upon, to invade (*Spenser*). 2. To attack with argument, or censure. (*Pope*).

ASSAILABLE *a* (from *assail*) That may be attacked (*Shakespeare*).

ASSAILANT *s* (*assailant*, Fr.) He that attacks (*Hayward*).

ASSAILANT *a*. Attacking, invading (*Milton*).

ASSAILER *s*. (from *assail*.) One who attacks another (*Sidney*).

ASSAM, a country of Asia, bounded on the W. by Bengal and Boctan, on the N. by the mountains of Thibet, and on the E. and S. by Meckley. The river Brahmaputra flows through the whole length of it, and empties in the Ghergen. The natives prefer the flesh of dogs to any other kind of animal food. They pay no taxes, the king being the sole proprietor of all the gold, silver, and other metals found in his kingdom. They live comfortably, almost

# ASS

each being supposed to have an elephant, for the constancy of this wives. The invention of gunpowder is ascribed to the Assamese. It is certain that gunpowder was known in China and Hindostan, far beyond all periods of investigation; and in the code of Genoa laws is a prohibition of the use of fire-arms. Assam lies between 91 and 96 E. lon. and 25 and 28 N. lat.

**ASSAPANICH**, a name sometimes given to the living squirrel.

**ASSAR**, in geography, a river of Abyssinia, which is the largest river Mr. Bruce saw except the Nile.

**ASSARIUM**, a small copper coin, being a part or diminutive of the as.

**ASSARON**, or **OMER**, a measure of capacity, in use among the Hebrews, containing five pints. It was the measure of manna which God appointed for every Israelite.

**ASSART**, *s. (assart, French)* An offence committed in the forest, by plucking up woods by the roots (*Cowell*).

**ASSASIN**, or **ASSASSIN**, a person who kills another with the advantage either of an inequality in the weapons, or by means of the situation of the place, or by attacking him unawares.

The word assassin is said by some to have been brought from the Levant, where it took its rise from a certain prince of the family of the Arsacidae, popularly called Assassins, living in a castle between Antioch and Damasco, and bringing up a number of young men, ready to pay a blind obedience to his commands; whom he employed in murdering the princes with whom he was at enmity. But according to Mr. Volney, the word Hassassin (from the root has, to kill, to assassinate, to listen, to surprise), in the vulgar Arabic signifies robbers of the night, persons who lie in ambush to kill; and is very universally understood in this sense at Cairo and in Syria. Hence it was applied to the Batenians, who slew by surprise.

**ASSASSINS**, a tribe or clan in Syria, called also Ismaelians and Batenists or Batenians. These people properly owed their origin to the Karmatians, a famous heretical sect among the Mahometans, who settled in Persia about the year 1090; whence, in process of time, they sent a colony into Syria, where they became possessed of a considerable tract of land among the mountains of Lebanon, extending itself from the neighbourhood of Antioch, to Damasco. The first chief and legislator of this remarkable tribe appears to have been Hassan Sabah, a subtle impostor, who, by his artful and insinuating and implicit slaves of his subjects. Their religion was compounded of that of the Magi, the Jews, the Christians, and the Mahometans, but the capital article of their creed was to believe that the Holy Ghost resided in their chief; that his orders proceeded from the heaven, and were real decorations of his empire. To this monarch the Mahometans gave the name of Sheikh; but he is known in Europe by the name of the Red Headed Man.

# ASS

**ASSASSINATE** *s. (from assassin)* The crime of an assassin's murder (*Pope*).

*To ASSASSINATE v. a. (from assassin)* 1 To murder by violence (*Dryden*) 2 To waylay; to take by treachery (*Milton*).

**ASSASSINATION**, *s. (from assassin)* The act of assassinating, murder (*Clarendon*).

**ASSASSINATOR**, *s. (from assassin)* Murderer, mankiller.

**ASSATION**, *s. (assatus, roasted, Lat)* Roasting (*Brown*).

**ASSAULT**, *s. (assault, French)* 1 Assault opposed to defence (*Shaks*) 2 Storm opposed to sap or siege (*Bacon*). 3 Hostile violence (*Spenser*) 4 Invasion; hostility, attack.

**ASSAULT**, in law, is an attempt to offer to beat another, without touching him, as if one lifts up his cane or his fist in a threatening manner at another, or strikes at him, but misses him, this is an assault, insultus, which Finch describes to be "an unlawful setting upon one's person." This is also an inchoate violence, amounting considerably higher than bare threats, and therefore, though no actual suffering is proved, yet the party injured may have redress by action of trespass vi et armis, wherein he shall recover damages as a compensation for the injury.

*To ASSAULT v. a. (from the noun)* To attack, to invade (*Dryden*).

**ASSAULTER**, *s. (from assault)* One who violently assaults another (*Sidney*).

**ASSAY**, or **ESSAY**, called in ancient statutes, the touch, is the proof or trial of the goodness of money, or the purity of wrought gold and silver utensils, and the method still in use for these purposes was first established by an act of the English parliament in 1354. In a more enlarged sense,

**ASSAYING**, in metallurgy, or the docimastic art, is used to express those chemical operations which are made in small to ascertain the quantity of metal contained in ores, or to discover the value or purity of any mass of gold, silver, or any other metal. This mode of examination differs from analysis in being principally concerned about only one of the ingredients in the ore or alloy, whereas the object of the latter is to ascertain the quantity and proportion of every substance in the mass to which it is applied. Thus in the assay of copper ores, the object is to know the proportion of pure metallic copper which a given weight of the ore can be made to yield, disregarding all the other component parts, such as the sulphur, iron, arsenic, &c. or, rather, confounding them together under the general term impurities. Thus also in the assay of a mixture of gold, or of gold and silver, with copper, lead, tin, or any other of the inferior metals, the whole attention is directed to the proportion of fine, or of gold and silver contained in the alloy.

In the assaying of ores, the methods differ in some respects according to the nature of the ore, or of the metal which it is supposed to contain. Each metal has its proper and improper ores,

which have peculiar characters and appearances, and from which persons accustomed to use them know pretty nearly what metal they will afford; but the general principles of the process are as follow

As metals are very unequally distributed in their ores, it is necessary, for the purpose of guarding against false and deceitful assays, to take care that the proportionable quantity of metal produced by any assay shall be nearly the medium contained in the whole ore. This is effected by taking specimens from the several veins of the mine, if there be several, or from different places of the same vein, so that the selection shall consist, as nearly as can be judged, of the richest, the poorest, and those of a middle nature between the two. These are to be washed with water, which carries off a part of the gangue or matrix and after being carefully weighed, roasted with due care, either in a small earthen pot covered over with another, or in a stone retort. When the ore has been kept red hot till it cease to exhale vapours, the roasting is finished. The residue is to be again weighed, that it may be known how much it has lost by the operation. After being roasted, the ore must next be melted, which is done by mixing it with three parts of black flux, and a little decrepitated common salt, enclosing the mixture in a crucible covered closely with a lid, and placing it in a good fusing furnace. When the fusion is finished, the contents of the crucible must be permitted to cool slowly. The fusion is known to be complete, if the metal be united in one lump, the upper surface of which is of a convex form, if no grains of it appear intermixed with the scoriae, and if the scoriae be compact, uniform, and vitreous, and covered over with a crust of melted marine salt. The lump of metal is to be carefully weighed, which discovers the proportion in which the metal exists in the ore. The instrument employed for the purpose of weighing, in these processes, is called an assay balance, a description of which will be found under the word **BALANCE**.

But some ores are harder and more refractory than to yield to the method already mentioned. Fluxes of a more active, and those in greater quantity, must then be employed, such as borax, pounded glass, fixed alkali, &c. The same mineral often contains an intermixture of what are called imperfect and perfect metals, that is, of those whose properties are altered by being heated in the air, and of those which, under such circumstances, remain unchanged. These may be separated by heating the lump of metal in the air, by which the imperfect metal is converted to an oxide, and carried off, leaving the perfect metal in a state of purity. This operation bears the general name of refining. The perfect metal obtained by this process is almost always a mixture of gold and silver, which may be separated by a solvent which acts on silver, leaving the gold uninjured. This operation is called parting.

A method less accurate, but sometimes more readily applied, and of equal utility, is frequent-

ly made use of where great works are carried on. In this method cheaper materials are employed, and less caution is observed. The ore is assayed by melting it on coals in a fusing furnace; the coals reduce the metallic oxide, and the fixed alkali, which is produced as they burn, absorbs part of the mineralizer. It is sometimes found necessary to add a small quantity of bling or scoræ, in order to facilitate the fusion of very refractory ores.

When it appears, from a particular assay, or a series of assays, that the working of a mine is likely to be profitable a train of operations takes place, an account of which will be given under the word **METALLURGY**.

There is a method of assaying metals in the humid way, which may be employed to discover what metals are contained in pieces of ore meant to be laid up in collections of objects of natural history. A small bit broken off from the piece of ore, is digested among acids, which dissolve the metal, and separate the mineralizer. The salt produced by the union of the metal with the acid, shews the quantity of metal. But as all metals are not subject to the action of acids, only certain ores can be assayed in this manner. Bergman has written an excellent Dissertation on this subject, to which the reader may be referred with advantage.

These are the general principles and operations of assaying ores: how they are applied to the different ores, and what variations take place in different circumstances, will be seen under the articles which treat of the metals, a list of which will be given under the words **ORE**, and **METAL**.

We now proceed to the Assaying of Metals, the purpose of which is to ascertain their purity, and their fitness for different purposes in commerce and the arts. Different methods are necessary for the examination of the various metals, and these will be noticed under their respective names. It may, however, be proper to observe, in this place, that as gold and silver are of superior value, are used for the purposes of money and exchange, and are the materials of the most costly and splendid utensils and ornaments, they have obtained a greater accuracy in their assay than any other of the metallic bodies. These two metals, in a state of absolute purity, are unfit for many of the purposes of manufacture or coinage, and are too soft to sustain much wearing or circulation, they are therefore mixed or alloyed with other metals to make them firmer, and better for working: and it is one great object of assaying these metals to discover or assign the proportion of alloy to be mixed with them. This proportion is decided by legislative authority; and when the metal is reduced to its proper state, it is said to be of the standard goodness. See **COINAGE**.

*Assaying of Coins.* The celebrated Laproth has made a series of experiments to determine the composition of many ancient coins, from which it appears that the Greeks for their early coins employed in general a mixture of copper,



zinc, and lead; and that the Roman coins are of two kinds, one of which consists only of copper, and the other of a mixture of copper and silver. The manner and results of these experiments are particularly detailed in *Tilloch's Philosophical Magazine*, vol. xvii. p. 266.

**TO ASSAY** *v. a.* (*assayer*, French) 1 To make trial of (*Hayward*). 2 To apply to, "as the touchstone in assaying metals" (*Milton*) 3 To try, to endeavour (*Samuel*)

**ASSAY BALANCE**: See **BALANCE**

**ASSAY-MASTER**, an officer, under certain corporations, entrusted with the care of making true touch, or assay, of the gold and silver brought to him; and giving a just report of the goodness or badness thereof. Such is the assay-master of the mint in the Tower, called also assayer of the king. The assay-master of the goldsmiths' company is a sort of assistant warden, called also a touch-warden, appointed to survey, assay, and mark all the silver work, &c. committed to him.—There are also assay-masters appointed by statute, at York, Exeter, Bristol, Chester, Norwich, Newcastle, and Birmingham, for assaying wrought plate.

**ASSAYER** *s.* (from *assay*) An officer of the mint, for the due trial of silver (*Chapel*)

**ASSECTATION** *s.* (*assectatio*, Latin) Attendance, or waiting upon.

**ASSECUTION** *s.* (from *assequor*, *assecutum*, Lat. to obtain) Acquirement (*Ayliffe*)

**ASSEMBLAGE** *s.* (*assemblage*, French)

1. A collection, a number of individuals brought together (*Locke*) 2 The state of being assembled (*Thomson*)

**TO ASSEMBLE** *v. a.* (*assembler*, Fr) To bring together into one place (*Shakspeare*)

**TO ASSEMBLE** *v. n.* To meet together (*Daniel*)

**ASSEMBLY** *s.* (*assemblée*, Fr) A company met together (*Shakspeare*)

**ASSEMBLY**, in the beau-monde, an appointed meeting of fashionable persons of both sexes, for the sake of play, dancing, gallantry, conversation, &c.

**ASSEMBLY**, in the military art, the second beating of a drum before a march, at which the soldiers strike their tents, roll them up, and stand to arms.

**ASSEMBLIES** of the clergy are called convocations, synods, councils, the annual meeting of the church of Scotland is called a general assembly.

The *General Assembly* possesses the highest authority in the church of Scotland, a presbytery, composed of fewer than 12 parishes, sends two ministers and one ruling elder; to this assembly, if it contain between 12 and 18 ministers, it sends three of these, and one ruling elder; if it contain between 18 and 24 ministers, it sends four ministers and two ruling elders; and if 24 ministers, it sends five with two ruling elders. Every royal borough deputes one ruling elder, and Edinburgh two, and their election must be attested by the commissioners of their respective boroughs. Every university sends one commissioner from its own body. The commissioners are chosen

annually six weeks before the meeting of the assembly; and the ruling elders are often men of the first eminence for rank and talents. In this assembly, which meets once a year, the king presides, by his commissioner, who is always a nobleman; but he has no voice in their deliberations.

**Assembly of Divines**, is the name given to an association of ministers and others, summoned, by an ordinance of parliament, in the year 1643, to meet at Westminster, "for settling the government and liturgy of the church of England, and for vindicating and clearing the said church from false aspersions and interpretations." This assembly consisted of 121 divines and 30 laymen, "celebrated in their party" says Mr Hume, "for piety and learning." The several parties in this assembly were composed of Presbyterians, Episcopians, and Independents. The works of the assembly, besides some letters to foreign churches, and occasional admonitions, were 1 "Their humble advice to parliament, for ordination of ministers, and settling the presbyterian government" 2 "A directory for public worship" 3 "A confession of faith" 4 "A larger and a shorter catechism" 5 "A review of some of the thirty-nine articles."

"When posterity," says Mr Neale, shall impartially review this assembly of divines, and consider the times in which they lived, they will have a just veneration of their memory, for, though their sentiments in divinity were in many instances too narrow and contracted, yet, with all their faults, amongst which their persecuting zeal for religion was not the least, they were certainly men of real piety and virtue, who meant well, and had the interest of religion at heart; and most of them possessed as much learning as any of their contemporaries." The excellent Richard Baxter, who knew most of them, says, "They were men of eminent learning, godliness, ministerial abilities, and fidelity; and being not worthy to be one of them myself," says he, "I may more fully speak the truth which I know, even in the face of malice and envy, that, as far as I am able to judge by the information of history, and by any other evidences, the christian world since the days of the apostles, had never a synod of more excellent divines than this synod, and the synod of Dort. See further Clarendon's Hist. vol. i. p. 530. Hume's Hist. vol. vii. p. 32. Neal's Hist. Pur. vol. i. p. 35. See p. 345. 4to.

**ASSENT**, in a general sense, implies an agreement to something proposed or affirmed by another. The royal assent is the approbation given by the king to a bill in parliament, after which it becomes a law.

Dr Hartley distinguishes assent into two kinds, rational and practical. He defines Rational assent as a readiness to affirm a proposition to be true, arising from a close association of the ideas suggested by the proposition, with the idea, or internal feeling, belonging to the word truth, or of the terms of the proposition, with the word truth: Rational dissent is the

opposite to this **Practical assent** is a readiness to act in such manner as the frequent vivid recurrency of the rational assent disposes us to act, and practical dissent the contrary. Practical assent is, therefore, the natural and necessary consequence of rational, when sufficiently impressed. There are, however, two cautions to be subjoined, viz. First, That some propositions, mathematical ones for instance, admit only of a rational assent, the practical not being applied to them in common cases. Secondly, That the practical assent is sometimes generated, and arrives at a high degree of strength, without any previous rational assent, and by methods that have little or no connection with it. Yet still it is, in general, much influenced by it, and, conversely, exerts a great influence upon it. Hartley on Man, vol I p 325. See also Reid on Intellect Powers of Man p 353, for another theory.

**TO ASSE/NT** *v a* (*assentire*, Latin) To concede, to yield to (*Acts*)

**ASSENTIATION** *s* (*assentatio*, Lat) Compliance with the opinion of another out of flattery or dissimulation.

**ASSENTMENT** *s* (from *assent*) Consent (*Brown*)

**ASSER**, John (or **ASSERIUS MENEVEN-SIS**, that is, Asser of St David's), bishop of Shirlburn in the reign of Alfred the Great. He was born in Pembrokeshire, in South Wales, and educated in the monastery of St David's by the archbishop Asserius, who, according to Ireland, was his kinsman. In this monastery he became a monk, and by his assiduous application soon acquired universal fame as a person of profound learning and great abilities. Alfred, the munificent patron of genius, about the year 880, sent for him to court. The king was then at Dean in Wiltshire. He was so charmed with Asser, that he made him his preceptor and companion. As a reward for his services, he appointed him abbot of two or three different monasteries, and at last promoted him to the episcopal see of Shirlburn, where he died, and was buried, in the year 910. He was, says Pits, a man of a happy genius, wonderful modesty, extensive learning, and great integrity of life. He is said to have been principally instrumental in persuading the king to restore the university of Oxford to its pristine dignity and lustre.—He wrote, *De vita et rebus gestis Alfredi*, &c Lond 1574, published by archbishop Parker, in the old Saxon character, at the end of Walsingham's hist.—Franc 1602, fol Oxf 1722, 8vo. Many other works are ascribed to this author by Gale, Bale, and Pits, but all doubtful.

**TO ASSE/RT** *v a* (*assero*, Latin) 1 To maintain, to defend either by words or actions (*Dryden*) 2 To affirm, to declare positively 3 To claim, to vindicate a title to (*Dryden*)

**ASSE/RTION** *s* (from *assert*) 1 The act of asserting, 2 Position advanced (*Brown*)

**ASSE/RTIVE** *a* (from *assert*) Positive; dogmatical, peremptory (*Glennville*)

**ASSE/RTOR** *s* (from *assert*) Maintainer, vindicator, affirmer (*Prior*)

**TO ASSE/RVE** *v a* (*asservo*, Latin) To serve, help, or second.

**ASSES CUCUMBER** See *MEMORICA*.

**ASSAS MILK**. This is preferred to cows and other kinds of milk in phthisical cases, and where the stomach is weak, as containing few oleaginous particles and being more easily converted into chyle. It is more aqueous than human, goats, cow's, or mare's, and contains more sugar than the goat's, sheep's, or cow's in this last respect it only yields to the mares, and human milk.

**ASSES**, order of, a denomination of Mathurins, or Trinitarians, so called because they were obliged, in travelling, to ride on asses, not horses.

**TO ASSE/SS** *v a* (from *assessare*, Italian) To charge with any certain sum (*Bacon*)

**ASSE/SSION** *s* (*assessio*, Lat) A sitting down by one, to give assistance or advice.

**ASSE/SSMENT** *s* (from *to assess*) 1. The sum levied on certain property 2 The act of assessing (*Howel*)

**ASSE/SSOR** *s* (*assessor*, Latin) 1 The person that sits by another, generally used of those who assist the judge (*Dryden*) 2 He that sits by another, as next in dignity (*Mil*) 3 (from *assess*) He that lays taxes.

**ASSETS**, (Fr *assez*, i e *satis*, enough,) in law, signifies goods enough to discharge that burden which is cast upon the executor or heir, in satisfying the debts and legacies of the testator or ancestor. Bro tit Assets. Assets are real or personal, where a man hath lands in fee-simple, and dies seised thereof, the lands which come to his heir, are assets real, and where he dies possessed of any personal estate, the goods which come to the executor, are assets personal. Assets are also divided into assets per descent, and assets inter males. Assets by descent, is where a person is bound in an obligation, and dies seised of lands which descend to the heir, the land shall be assets, and the heir shall be charged as far as the land to him descended will extend. Assets inter males, is when a man indebted makes executors, and leaves them sufficient to pay his debts and legacies, or where some commodity or profit ariseth to them in right of the testator, which are called assets in their hands.

**TO ASSE/VER**, **TO ASSE/VERATE** *v a* (*assevero*, Lat) To affirm with great solemnity, as upon oath.

**ASSE/VERATION** *s* (from *asseverate*) Solemn affirmation, as upon oath (*Hooker*)

**ASS/HEAD** *s* (from *ass* and *head*) One slow of apprehension, a blockhead (*Shakspeare*)

**ASSIDEANS**, or rather **HASIDEANS**, in antiquity, a sect among the Jews, thus called from the Hebrew *חסידים*, *hasidim*, merciful, righteous. The Assideans are recorded as holding works of supererogation, necessary. They were the fathers and predecessors of the Pharisees; and from them likewise arose the Esseni.

**ASSIDU/TTY** *s* (*assiduitas*, Fr) Diligence (*Rogers*)



**ASSIDUOUS** *a* (*assiduus*, Lat.) Constant in application (*Prior*)

**ASSIDUOUSLY** *ad* (from *assiduus*) Diligently, continually (*Bentley*)

**ASSIDUUS**, or **ADSIDUUS**, among the Romans, denoted a rich or wealthy person. The word in this sense is derived from *as* assis, *q d.* a moneyed man

**ASIENTO**, a Spanish word, signifying a farm, in commerce, is used for a bargain between the king of Spain and other powers, for importing negroes into the Spanish dominions in America, and particularly to Buenos Ayres. The first asiento was made by the French Guinea company, and by the treaty of Utrecht, transferred to the English, who were to furnish 4800 negroes annually

To **ASSIGN** *v n* (*assigner*, French) 1 To mark out, to appoint (*Addison*) 2 To fix with regard to quality or value (*Loc*) 3 (In law) To appoint a deputy, or make over a right to another (*Cowell*)

**ASSIGN** *s* A person to whom a thing is assigned, or made over

**ASSIGNABLE** *a* (from *assign*) That may be marked out, fixed, or made over (*South*)

**ASSIGNATION** *s* (*assignatio*, Latin) 1 An appointment to meet used generally of love appointments (*Swift*) 2 A making over a thing to another

**ASSIGNE'E** *s* (*assigne*, Fr) He that is appointed or deputed by another to do any act, or perform any business, or enjoy any commodity

**ASSIGNEES**, under a commission of bankruptcy, are persons to whom the bankrupt's estate is assigned, for the benefit of the creditors

**ASSIGNER** *s* (from *assign*) He that appoints (*Decay of Piety*)

**ASSIGNMENT** *s* (from *assign*) Appropriation of one thing to another thing or person (*Locke*)

**ASSIGNMENT**, the act of assigning, or transferring the interest or property a man has in any thing, or of appointing and setting over a right to another

No estate of freehold or term for years shall be assigned, but by deed in writing signed by the parties, except by operation of law Stat. 29 Car II c 3 If lessee for years assigns all his term in his lease to another, he cannot reserve a rent in the assignment, for he hath no interest in the thing by reason of which the rent reserved should be paid, and where there is no reversion, there can be no distress but debt may lie on it as on a contract 1 Litt. abr 99. If an assignment is made by an assignee, the first assignee is not suable for the rent, for if he be accepted by the lessor, the admission of one assignee is the admission of twenty Comp. Acton 491. Bonds, &c are assigned by power of attorney, to receive and sue in the assigner's name: but bills of exchange are assignable by indorsement, and the assignees may recover in their own names, by 1 R. 2 and 4 Ann, c 9.

The *assignment of a dower*, is the setting out of a woman's marriage-portion by the heir

**ASSIMILABLE** *a* (from *assimilate*) That may be converted to the same nature with something else (*Brown*)

To **ASSIMILATE** *v n* (*assimilo*, Lat) To perform the act of converting food to nourishment (*Bacon*)

To **ASSIMILATE** *v a* 1 To bring to a likeness, or resemblance (*Swift*) 2 To turn to its own nature by digestion (*Newton*)

**ASSIMILATENESS** *s* (from *assimilate*) Likeness

**ASSIMILATION** *s* (from *assimilate*) 1 The act of converting any thing to the nature or substance of another (*Bacon*) 2 The state of being assimilated, or becoming like something else (*Brown*)

**ASSIMILATION**, **ASSIMILATIO**, in physics, is properly a motion whereby bodies convert other duly disposed bodies into a nature like, or homogeneous to their own Instances of this assimilation we see in flame, which converts the oily or other particles of fuel into its own fiery and luminous nature The like also appears in air, smoke, and spirits of all kinds

Some metaphysicians have recourse to a similar principle, to account for many operations of the human mind and some medical men of eminence have contended, that an assimilation of disposition is necessary to a certain degree for the propagation of the human species, as is often observed where persons are married some years before they have children See Jarrold's Reply to Malthus on Population

**ASSIMILATION**, in medicine See **ANIMULATION**

**ASSIMILIS** A species of *Gryllus*

**ASSIMILIS** A species of *Sphinx* that inhabits Iranquebar

**ASSIMULATION**, (*assimulatio*, from *ad*, and *similis*, to make like to) See **ASSIMILATION**

**ASSISE**, in old English law books, is defined to be an assembly of knights, and other substantial men, together with a justice in a certain place, and at a certain time, but the word in its present acceptation implies a court, place, or time, when and where the writs and processes, whether civil or criminal, are decided by judge and jury

All the counties of England are included in six circuits, and two judges are assigned by the king's commission, who hold their assizes twice a year in every county (except London and Middlesex, where courts of nisi prius are holden in and after every term, before the chief or other judge of the several superior courts, and except the four northern counties, where the assizes are taken only once a year,) to try by a jury of the respective counties the truth of such matters of fact as are then under dispute in the courts in Westminster-hall These judges of assize came into use in the room of the ancient justices in eyre, *justicarii itinere*, who were regularly established, if not first appointed, by the parliament of Northampton, A D 1176, 22 Henry II. with a delegated

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power from the king's great court or aula regia, being looked upon as members thereof and they afterwards made their circuit round the kingdom once in seven years for the purpose of trying causes. They were afterwards directed by magna charta, c 12 to be sent into every county once a-year to take or try certain actions then called recognitions or assises, the most difficult of which they are directed to adjourn into the court of common pleas to be there determined. The itinerant justices were sometimes mere justices of assise, or of dower, or of gaol delivery and the like, and they had sometimes a more general commission, to determine all manner of causes justicarii ad omnia placita but the present justices of assise and nisi prius are more immediately derived from the statute West 2 13 Edw I c 30 explained by several other acts, particularly the statute 14 Edw III c 16 and must be two of the king's justices of the one bench or the other, or the chief baron of the exchequer, or the king's sergeants sworn. The judges usually make their circuits in their respective vacations after Hilary and Trinity terms, and they now sit by virtue of five several authorities. 1 The commission of the peace, in every county of the circuits and all justices of the peace of the county are bound to be present at the assises, and sheriffs are also to give their attendance on the judges, or they shall be fined. 2 A commission of oyer and terminer, directed to them and many other gentlemen of the county, by which they are empowered to try treasons, felonies &c and this is the largest commission they have. 3 A commission of general gaol delivery, directed to the judges and the clerk of assise associate, which gives them power to try every prisoner in the gaol committed for any offence whatsoever but none but prisoners in the gaol so that one way or other they rid the gaol of all the prisoners in it. 4 A commission of assise, directed to the judges and clerk of assise, to take assises, that is, to take the verdict of a peculiar species of jury called in assise, and summoned for the trial of landed disputes. The other authority is, 5 That of nisi prius, which is a consequence of the commission of assise, being annexed to the office of those justices by the statute of Westm 2 13 Edw I c 30 And it empowers them to try all questions of fact issuing out of the courts of Westminster, that are then ripe for trial by jury. The original of the name is this all causes commenced in the courts of Westminster hall are by the course of the courts appointed to be there tried, on a day fixed in some Easter or Michaelmas term, by a jury returned from the county wherein the cause of action arises, but with this proviso, nisi prius justiciarii ad assisas capiendas venerint, unless before the day prefixed the judges of assise come into the county in question. This they are sure to do in the vacations preceding each Easter and Michaelmas term, and there dispose of the cause, which saves much expense and trouble, both to the parties, the jury, and the witnesses.

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The word *Assise* (from the French *asseis*, seated, settled, or established, and formed of the Latin verb *assideo*, I sit by), is used in several different senses. It is sometimes taken for the sittings of a court, sometimes for its regulations or ordinances, especially those that fix the standard of weights and measures, and sometimes it signifies a jury, either because juries consisted of a fixed determinate number, or because they continued sitting till they pronounced their verdict.

*Assise* (Black), in history, an assise held at Oxford in July, 1577, so called on account of a sudden damp which is said to have arisen, and after nearly smothering the whole court and audience, occasioned the death of the judge, high-sheriff, most of the jury, and above 500 of the spectators. This fatality was ascribed by the vulgar to magic, but the discernment of lord Bacon saw through the mist of superstition. The symptoms of this disorder, which seems to have been the first appearance of the great fever in England, marked the most extreme putridity.

*To ASSIST* *v a* (*assistere*, Fr *assistre*, Lat) *To help (Romans)*

*ASSISTANCE* *s* (*assistance*, Fr) *Help, furtherance (Stillington)*

*ASSISTANT* *a* (from *assist*) *Helping, lending aid (Hale)*

*ASSISTANT* *s* (from *assist*) *A person engaged in an affair not is principal, but as auxiliary or ministerial (Bacon)*

*ASSIZE* See *Assise*

*To ASSIZE* *v a* (from the noun) *To fix the rate of any thing by an assize or writ*

*ASSIZER* *s* (from *assize*) *An officer that has the care of weights and measures (Chamb)*

*ASSOCIABLE* *a* (*associabilis*, Lat) *That in it is joined to another*

*To ASSOCIATE* *v a* (*associer*, French) 1 *To unite with another as a confederate (Shaks)* 2 *To adopt as a friend upon equal terms (Dryden)* 3 *To accompany (Shaks)* 4 *To unite, to join (Boyle)*

*ASSOCIATE* *a* (from the verb) *Confederate, joined in interest or purpose (Milton)*

*ASSOCIATE* *s* (from the verb) 1 *A partner (Sidney)* 2 *A confederate (Hooker)* 3 *A companion (Wotton)*

*ASSOCIATION* *s* (from *associate*) 1 *Union, conjunction, society (Hooker)* 2 *Confederacy (Hooker)* 3 *Partnership (Boyle)* 4 *Connexion (Watts)* 5 *Apposition, union of matter (Newton)*

*ASSOCIATION OF IDEAS*, is where two or more ideas constantly and immediately follow or succeed one another in the mind, so that one shall almost infallibly produce the other, whether there be any natural relation between them, or not.

*Association* forms a principal part of Dr Hartley's theory of the mind. He distinguishes it into synchronous and successive, and ascribes our simple and complex ideas to the influence of this principle or habit. Particular sensations result from previous vibrations conveyed through

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the nerves to the medullary substance of the brain; and these are so intimately associated together, that any one of them, when unpressed alone, shall be able to excite in the mind the ideas of all the rest. Thus we derive the ideas of natural bodies from the association of the several sensible qualities with the names that express them, and with each other. The sight of part of a large building suggests the idea of the rest instantaneously, by a synchronous association of the parts, and the sound of the words, which begin a familiar sentence brings to remembrance the remaining part, in order, by successive association. Dr Hartley maintains, that simple ideas run into complex ones by association, and apprehends, that by pursuing and perfecting this doctrine, we may some time or other be enabled to analyse those complex ideas, that are commonly called the ideas of reflection, or intellectual ideas, into their several component parts, i. e. into the simple ideas of sensation of which they consist, and that this doctrine may be of considerable use in the art of logic, and in explaining the various phenomena of the human mind (*Observations on Man*).

It has been objected against Hartley's theory, that it leads to materialism, and indeed, it must be confessed, that his followers have sometimes, by their warmth, hurried themselves into that cold and comfortless system; but Hartley himself was of opinion these consequences could not be fairly drawn from his theory, he asserted, that he did not presume even to intimate that matter could be endued with the power of sensation, and that the materiality of the soul was no consequence of his doctrine. Whatever opinions, however, may be held as to his philosophy, no doubt can be reasonably entertained of the warmth of his piety, and the steadiness of his faith in the gospel.

**ASSODES** (*ασοδης*, from *ασοωμαι*, to *nu scate*) A continual fever, attended with a loathing of food.

**ASSONANCE**, in rhetoric and poetry, a term used where the words of a phrase, or a verse, have the same sound or termination, and yet make no proper rhyme.

**ASSONANT** *a* Sounding in a manner resembling another sound.

**ASSONANT RHYMES** is a term particularly applied to a kind of verses common among the Spaniards, where a resemblance of sound serves instead of a natural rhyme. Thus, *ligera, cultura, tierra, mesa*, may answer each other in a kind of assonant rhyme, because they have each an *e* in the penultimate syllable, and an *a* in the last.

**ASSONIA**, in botany, a genus of the class and order monadelphia, dodecandria. Calyx double; the outer leaved, lateral bractiform, five-lobed; petals, five; stamens twenty, of which five are barren; styles five, capitate five, united, one-celled, two-seeded. The only known species is a native of Bour-

**ASSORT** *v a* (*assorter*, Fr.) To range

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**ASSORTMENT** *s* (from *assort*) 1 The act of classing or ranging. 2 A mass or quantity properly selected and ranged.

**To ASSOT** *v a* (from *sot*, *assoter*, Fr) To infatuate out of use (*Spenser*).

**To ASSUAGE** *v a* (proper, Saxon) 1 To mitigate, to soften, to allay (*Addison*). 2 To appease, to pacify (*Clarendon*).

**To ASSUAGE** *v n* To abate (*Genesis*).

**ASSUAGEMENT** *s* (from *assuage*) Mitigation, abatement of evil (*Spenser*).

**ASSUAGER** *s* (from *assuage*) One who pacifies or appease.

**ASSUAGIVL** *a* (from *assuage*) Softening, mitigating (*Pope*).

**To ASSUBUGATE** *v a* (*subjugare*, Lat) To subject to not in use (*Shakspeare*).

**ASSUFACTION** *s* (*assufacio*, Lat) The state of being accustomed (*Brown*).

**ASSUEFUDGE** (*assuetudo*, Lat) Accustomance, custom, habit (*Bacon*).

**To ASSUME** *v a* (*assumo*, Lat) 1 To take (*Pope*). 2 To take upon ones self (*Dryden*). 3 To arrogate, to claim or seize unjustly. 4 To suppose something without proof (*Boyle*). 5 To appropriate (*Clarendon*).

**ASSUMER** *s* (from *assume*) An arrogant man (*South*).

**ASSUMING** *participial a* (from *assume*) Arrogant, haughty (*Dryden*).

**ASSUMPSIT** in the law of England a voluntary or verbal promise, whereby a person assumes, or takes upon him to perform or pay any thing to another. A promise is in the nature of a verbal covenant and wants nothing but the solemnity of writing and sealing to make it absolutely sure. If therefore it be to do any explicit act it is an express contract, as much as any covenant and the breach of it is an equal injury. The remedy indeed is not exactly the same, since instead of an action of covenant, there only lies an action upon the case, for what is called an assumpsit or undertaking of the defendant, the failure of performing which is the wrong or injury done to the plaintiff, the damages whereof a jury are to estimate and settle. As, if a builder promises, undertakes, or assumes to build, that he will build and cover his house within a time limited, and fails to do it, Cuius has an action on the case against the builder for this breach of his express promise, undertaking or assumpsit, and shall recover a pecuniary satisfaction for the injury sustained by such delay. So also in the case of a debt by simple contract, if the debtor promises to pay it and does not, this breach of promise entitles the creditor to his action on the case, instead of being driven to an action of debt. Thus likewise a promissory note, or note of hand not under seal, to pay money at a day certain, is an express assumpsit, and the payee at common law, or by custom and act of parliament the indorsee, may recover the value of the note in damages, if it remains unpaid. Some agreements indeed, though never so expressly made, are deemed of so important a nature, that they ought not to rest in verbal promise only, which cannot be proved but by the memory (which

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sometimes will induce the perjury of witnesses

To prevent this, the statute of frauds and perjury, 29 Car II c 3 enacts, that in the five following cases no verbal promise shall be sufficient to ground an action upon, but at the least some note or memorandum of it shall be made in writing, and signed by the party to be charged therewith 1 Where an executor or administrator promises to answer damages out of his own estate 2 Where a man undertakes to answer for the debt, default, or miscarriage of another 3 Where any agreement is made upon consideration of marriage 4 Where any contract or sale is made of lands, tenements, or hereditaments, or any interest therein 5 and lastly, Where there is any agreement that is not to be performed within a year from the making thereof In all these cases a mere verbal assumpsit is void

There is in law always an implied contract with a common innkeeper, to secure his guest's goods in his inn, with a common carrier or barge-master, to be answerable for the goods he carries, with a common farrier, that he shoes a horse well, without laming him, with a common taylor, or other workman that he performs his business in a workmanlike manner in which, if they fail, an action on the case lies to recover damages for such breach of their general undertaking Also, if an innkeeper or other victualler, hangs out a sign and opens his house for travellers, it is an implied engagement to entertain all persons who travel that way, and upon this universal assumpsit an action on the case will lie against him for damages, if he without good reason refuses to admit a traveller In contracts likewise for sales, if the seller doth upon the sale warrant it to be good, the law annexes tacit contract to this warranty, that, if it be not so, he shall make compensation to the buyer, else it is an injury to good faith, for which an action on the case will lie to recover damages

**ASSUMPTION** *s* (*assumptio*, Lat) 1 The act of taking any thing to ones self (*Hammond*) 2 The supposition of any thing without further proof (*Norris*) 3 The thing supposed, a postulate (*Dryden*) 4 The taking up any person into heaven (*Stillingfleet*),

**ASSUMPTION**, an episcopal city, and the metropolis of Paraguay, in South America It is situated at the mouth of the river Paraguay Lat 26 05 Lon 57 40 W

**ASSUMPTION**, an island near the coast of California Lon 120 W Greenwich Lat 28 4 N

**ASSUMPTION**, a river of North America, which runs into the river St Lawrence, opposite Montreal, in Canada

**ASSUMPTION**, a festival in the Romish church in honour of the miraculous ascent of the Virgin Mary into heaven the Greek church, who also observe this festival, celebrate it on the 15th of August with great ceremony

**ASSUMPTIVE**, *a* (*assumptivus*, Lat) That is assumed

## A S S

**ASSURANCE**, in commerce See **INSURANCE**

There are in London, and in different parts of the kingdom, several companies, each of which has a large capital funded, for the purpose of insuring from loss or damage by fire, buildings, furniture, goods in trade, merchandise, farming stock, ships in port, harbour, or dock, the cargoes of such ships, ships building or repairing, vessels on rivers and canals, the goods on board such vessels, &c These articles are commonly divided into three classes first, *common* assurances, which are effected at 2s per cent per annum, secondly, *hazardous* assurances, at 3s per cent per annum, and *doubtly hazardous*, at 5s per cent per annum, The mode of classification may be learnt from the proposals of the most respectable companies, which are, Royal Exchange Assurance Company, incorporated in 1719, Sun Fire Office, incorporated in 1706, London Assurance, incorporated in 1719, Hand in Hand Fire Office, incorporated in 1696, Union Fire Office, incorporated in 1714, Westminster Fire Office, incorporated in 1717, Phoenix Fire Office, established in 1782, British Fire Office, Imperial Insurance Company, 1803, Globe Insurance Office, 1803, Albion, 1805, Hope, 1807, Eagle, 1807 Besides various extensive companies in the country, as in Kent, Norfolk, &c

In 1782 a duty of 1s 6d was imposed on every 100l assured from loss by fire, which was increased in 1797 to 2s per cent, and in 1804 to 2s 6d per cent, the annual duty now payable From the produce of this duty, an estimate has been formed of the total amount of property assured from fire in Great Britain, which appears to have been nearly as follows

In 1785,	- - -	£125,000,000
1789,	- - -	142,000,000
1793,	- - -	167,000,000
1797,	- - -	184,000,000
1801,	- - -	223,000,000
1806,	- - -	260,000,000

We have also *assurances for life*, in virtue whereof, when the person assured dies, a sum of money becomes payable to the person in whose behalf the policy of assurance was granted

**ASSURANCES ON LIVES** By assuring a life is meant obtaining security for a sum of money to be received should the life drop, in consideration of such a payment made to the assurer, as is a sufficient compensation for the loss and hazard to which he exposes himself. The sum at which this compensation should be valued depends,—1 On the rate of interest at which money is improved And 2, On the probability of the duration of the life to be assured If interest is high, and also the probability high of the duration of the life, the value of the assurance will be proportionably low On the contrary, if the rate of interest is low, and the probability of living also low, the value of the assurance will be proportionably high In order to explain this let 100l be supposed to be assured on a life for a year

## A S S U R A N C E.

to come, that is, let 100*l* be supposed payable a year hence, provided a life of a given age fails in that time. Were the interest of money at 5 per cent and the life sure of failing, the value of the assurance would be the same with the present value of 100*l* payable at the end of the year, reckoning interest at 5 per cent that is, it would be that sum, which being now put out to interest at 5 per cent would produce 100*l* at the end of the year, or 90*l* 4*s* 8*d*.

On the contrary, if it be an even chance, or the odds are equal, whether the life does or does not fail in the year, the value of the assurance will be half the former value, or 47*l* 12*s* 4*d*. If the odds against its failing are two to one, that is, if it is to be expected that some one of three lives, at the age of the given life, will fail in the year, the value of the assurance will be a third of the first value, reckoning the same interest, or 31*l* 15*s*. If the odds are 19 to 1, or if it may be expected that some one out of twenty lives, at the age of the given life, will fail in a year, the value of the assurance will be a twentieth part of the first value, or 4*l* 16*s*. If the odds are 49 to 1, or only one out of fifty such lives as the given life can be expected to fail in the year, the value of the assurance will be a fiftieth part of the first value, that is, it will be 1*l* 18*s*. Now the odds of 3 to 1 are, according to Dr Halley's Table of Observations, the odds that a life aged 87 will not drop in a year. The odds of 19 to 1 are the odds, according to the same table, that a life aged 64 will not drop in a year. And the odds of 49 to 1 are the odds that a life aged 49 will not drop in a year. It follows, therefore, that the value of the assurance of 100*l* for a year, on a life aged 87 is 31*l* 15*s*, on a life aged 64, 4*l* 16*s*, on a life aged 49 1*l* 18*s* reckoning interest at 5 per cent. If interest is reckoned at 3 per cent these values will be 32*l* 7*s*—4*l* 17*s*—1*l* 18*s* 10*d*.

The principles on which the doctrine of life assurances and life annuities depends, are intimately connected with those of the doctrine of chances or probabilities we shall resume them more at large, and trace their gradual progress, under the article LIFE ANNUITIES.

When a life is assured for any number of years, the premium or value may be paid, either in one single present payment, in consequence of which the sum assured will become payable without any farther compensation, whenever, within the given term, the life shall happen to drop or the value may be paid in annual payments, to be continued till the failure of the life, should that happen within the term, or, if not, till the determination of the term. And the determination of the value of assurance, in all cases, is to be made out from the rules for computing annuities on lives; the principal writers on which are Halley, De Moivre, Simpson, Smart, Kersebaum, De Pareux, Price, Morgan, and Bayes. See also, LIFE ANNUITIES, Bayes, &c.

Assurances may be made either on *single lives*, as above explained, or they may be made on any number of *joint lives*, or on the *longest* of any lives, that is, an assurer may bind himself to pay any sums at the extinction of any *joint lives*, or the *longest* of any lives, or at the extinction of any one or two of any number of lives. There are further assurances on survivorships, by which is meant an obligation, for the value received, to pay a given sum or annuity, provided a given life shall survive any other given life or lives.

The principal offices for making these insurances, in England, are the London and the Royal Exchange Assurance Offices, the Amicable Society incorporated for a perpetual Assurance Office, the Society for equitable Assurances on Lives and Survivorships, and the Westminster Society for granting Annuities and insuring Money on Lives, the Pelican Life Insurance Office, the Globe Insurance Office, the British Assurance Office, the Albion, the Rock, and the Hope. Some of these offices have published extensive tables and proposals, shewing the rates at which their assurances are effected. The rates of the different companies are very nearly alike, and indeed they must be, if founded on correct principles, and equally advantageous to the public as a specimen we insert the following.

The person making the assurance is to declare the place and date of birth of the person whose life is to be assured. Whether he have had the small-pox. Whether subject to the gout. And whether in the army or navy.

### *Conditions of assurance made by persons on their own lives*

The assurance to be void if the person whose life is assured shall depart beyond the limits of Europe, shall die upon the seas (except in his majesty's packets passing between Great Britain and Ireland), or shall enter into or engage in any military or naval service whatever, without the previous consent of the company, or shall die by suicide, duelling, or the hand of justice, or shall not be, at the time the assurance is made, in good health.

### *Conditions of assurance made by persons on the lives of others*

The assurance to be void if the person whose life is assured shall depart beyond the limits of Europe, shall die upon the seas (except in his majesty's packets passing between Great Britain and Ireland), or shall enter into or engage in any military or naval service whatever, without the previous consent of the company, or shall not be, at the time the assurance is made, in good health.

Any person making an assurance on the life of another must be interested therein, agreeable to act of 14th of Geo III chap 48 which prohibits wagering, or speculative insurances.

# A S S U R A N C E.

## TABLL OF PREMIUMS

*For assuring the sum of one hundred pound, upon the life of any healthy person, from the age of eight to sixty-seven*

## A TABLE OF ANNUAL PREMIUMS

*Payable during the joint continuance of two lives for assuring one hundred pounds, on the contingency of one life surviving the other*

Age	One Year			Seven Years at an annual Payment of			For the whole Life at an annual Payment of			Ages		Premium
										Life to be assured	Life against which the Assurance is to be made	
8 to 14	0	17	9	1	1	5	1	17	7	10	10	1 8 6
15	0	17	11	1	2	11	1	18	7	20	1	1 9 1
16	0	19	2	1	4	7	1	19	8	30	1	1 8 3
17	1	1	2	1	6	5	2	0	8	40	1	1 7 8
18	1	3	3	1	7	5	2	1	4	50	1	1 6 11
19	1	5	3	1	8	6	2	2	8	60	1	1 6 4
20	1	7	3	1	9	5	2	1	7	70	1	1 5 11
21	1	8	10	1	10	5	2	0	6	80	1	1 5 4
22	1	9	3	1	10	0	2	4	5	10	1	1 16 6
23	1	9	3	1	11	0	2	6	3	20	1	1 17 9
24	1	10	2	1	11	6	2	7	1	30	1	1 15 9
25	1	10	7	1	12	1	2	8	1	40	1	1 14 8
26	1	11	1	1	12	7	2	9	1	50	1	1 13 6
27	1	11	7	1	13	9	2	10	1	60	1	1 12 1
28	1	12	1	1	13	4	2	11	3	70	1	1 10 6
29	1	12	8	1	14	11	2	12	5	80	1	1 8 4
30	1	13	3	1	14	11	2	13	5	10	2	2 5 5
31	1	13	9	1	15	7	2	14	7	20	2	2 6 6
32	1	14	4	1	16	10	2	15	9	30	2	2 4 6
33	1	15	0	1	17	4	2	16	1	40	2	2 2 9
34	1	16	4	1	18	10	2	17	10	50	2	2 0 11
35	1	17	0	1	19	8	3	1	4	60	1	1 18 7
36	1	17	9	2	2	0	3	2	6	70	1	1 16 9
37	1	18	5	2	2	2	3	4	6	80	2	2 19 2
38	1	19	5	2	2	2	3	5	9	10	2	2 18 2
39	2	2	0	2	2	5	3	7	11	20	2	2 15 11
40	2	2	3	2	2	6	3	8	8	30	2	2 12 11
41	2	2	6	2	2	7	3	9	9	40	2	2 9 4
42	2	2	6	2	2	9	3	10	11	50	2	2 5 11
43	2	2	6	2	2	10	3	11	11	60	2	2 1 10
44	2	2	6	2	2	10	4	12	7	70	2	2 0 11
45	2	2	9	2	2	14	4	13	5	80	2	2 1 10
46	2	2	9	2	2	14	4	14	5	10	4	4 0 1
47	2	2	10	2	2	14	4	15	7	20	4	4 17 10
48	2	2	12	2	2	18	4	16	5	30	4	4 13 7
49	2	2	13	3	3	0	4	17	7	40	3	3 7 7
50	2	2	17	3	3	4	4	18	9	50	3	3 1 6
51	2	2	19	3	3	9	4	19	7	60	3	2 15 0
52	3	3	0	3	3	12	4	20	6	70	4	4 16 9
53	3	3	0	3	3	14	4	21	4	80	4	4 18 9
54	3	3	5	3	3	17	5	22	2	10	5	5 16 3
55	3	3	8	3	3	17	5	23	0	20	5	5 14 0
56	3	3	12	3	3	17	5	24	2	30	5	5 10 7
57	3	3	13	3	3	17	5	25	4	40	5	4 9 4
58	3	3	18	4	4	10	6	26	7	50	6	6 17 11
59	4	4	1	4	4	15	6	27	9	60	7	7 1 0
60	4	4	3	4	4	15	6	28	11	70	8	8 2 9
61	4	4	7	4	4	15	6	29	13	80	8	8 10 10
62	4	4	10	4	4	15	6	30	15	10	9	9 7 7
63	4	4	13	4	4	15	6	31	17	20	10	10 5 6
64	4	4	17	4	4	15	6	32	19	30	11	11 8 8
65	4	4	20	4	4	15	6	33	21	40	12	12 5 9
66	5	5	0	5	5	17	7	34	23	50	13	13 15 8
67	5	5	3	5	5	17	7	35	25	60	14	14 8 9

## A TABLE OF ANNUAL PREMIUMS

*Payable during the continuance of two joint lives for assuring one hundred pounds, to be paid when either of the lives shall drop*

Age	Age	l	s	d	Age	Age	l	s	d	Age	Age	l	s	d	Age	Age	l	s	d
10	10	2	17	1	15	35	4	3	1	20	67	9	13	9	30	80	7	15	0
15	10	3	1	1	15	40	4	19	4	25	72	4	0	10	35	87	9	18	1
20	10	3	5	7	15	45	4	19	5	30	77	4	19	5	40	92	9	18	0
25	10	3	9	3	15	50	5	11	3	35	82	4	10	3	45	97	9	18	0
30	10	3	13	9	15	55	6	6	0	40	87	4	17	4	50	102	10	18	0
35	10	3	19	6	15	60	7	6	0	45	92	5	6	2	55	107	10	18	0
40	10	4	8	10	15	65	9	9	5	50	97	5	17	10	60	112	11	18	0
45	10	4	15	11	15	70	11	11	5	55	102	6	12	6	65	117	11	18	0
50	10	4	23	10	15	75	13	17	11	60	107	7	12	5	70	122	12	18	0
55	10	5	6	8	15	80	14	4	3	65	112	8	9	9	75	127	12	18	0
60	10	7	7	2	15	85	14	7	3	70	117	9	11	11	80	132	13	18	0
65	10	9	6	3	15	90	15	14	6	75	122	10	14	1	85	137	14	18	0
70	10	11	5	0	15	95	15	15	4	80	127	11	15	0	90	142	15	18	0
75	10	13	5	0	15	100	16	10	2	85	132	12	10	0	95	147	16	18	0
80	10	15	3	13	1	105	16	10	2	90	137	13	10	0	100	152	17	18	0
85	10	17	3	17	6	110	17	10	2	95	142	14	10	0	105	157	18	18	0

*Marine Assurance* is an indemnity against those perils to which ships and goods are exposed in the course of their voyage from one place to another, whether arising from the dangers of the seas, fire, capture by enemies or pirates, detention by the government of any country, or from any fraudulent act of the master or mariners, such as running away with the ship, carrying her a course different from their orders, sinking her, deserting her, or embezzling the cargo. Assurances of this kind being of peculiar importance to the commercial interests of this country, and many frauds having been committed in this business by persons receiving premiums who were totally unable to fulfil their engagements, an act of parliament was passed in the reign of George I. establishing two corporations with adequate capitals for carrying on this business, and prohibiting any other society or partnership whatsoever from making marine assurances or lending money on bottomry. The two companies are, the Royal Exchange Assurance and the London Assurance, who both engage very extensively in this species of insurance, but as from their superior responsibility they generally require a somewhat higher premium than private underwriters, many persons prefer effecting their assurances with the latter, this business, in London, is carried on chiefly in a set of rooms called Lloyd's coffee house, over the Royal Exchange, where four or five hundred underwriters assemble daily. Persons having an assurance to make generally employ a broker, who having prepared a policy, carries it to an underwriter whom he considers a responsible person, who if he considers the risk offered an eligible one to undertake, signs his name at the bottom of the policy, mentioning the sum he agrees to be answerable for, it is then taken to another, and so on till the whole sum mentioned in the policy is completed. The premium paid depends on the length of the voyage, the condition of the vessel, the season of the year, peace or war, and many other circumstances, of course it is very different at different periods.

*ASSURANCE* *s* (assurance, French) 1 Certain expectation (*Tillotson*) 2 Secure confidence, trust (*Spenser*) 3 Certain knowledge (*South*) 4 Firmness, undoubting steadiness (*Rogers*) 5 Confidence, want of modesty (*Sidney*) 6 Freedom from vitious shame (*Locke*) 7 Ground of confidence, security (*Dar*) 8 Spirit, intrepidity (*Dry*) 9 Sanguinity, readiness to hope (*Hammond*) 10 Testimony of credit (*Tillotson*) 11 Conviction (*Tillotson*) 12 Insurance see the preceding.

To *ASSURE* *v a* (assurer, French) 1 To give confidence by a firm promise (*Macca-bees*) 2 To secure another (*Rogers*) 3 To make confident, to exempt from doubt or fear, to confer security (*Milton*) 4 To make secure (*Spears*) 5 To affiancé, to betroth (*Shakespeare*).

*ASSURED* *participle a* (from *assure*) 1 Certain, undubitable (*Bacon*) 2 Certain

not doubting (*Shakespeare*) 2 Immodest vitiously confident

*ASSUREDLY* *ad* (from *assured*) Certainly, indubitably (*South*)

*ASSUREDNESS* *s* (from *assured*) The state of being assured, certainty

*ASSURER* *s* (from *assure*) 1 He that gives assurance 2 He that gives security to make good any loss

*ASSURGENTPETIOIE* In botany, rising up in a curve, declining at the base, but upright at the tip. Arising petiole, rising leaves.

*ASSYRIA*, a country of Asia, which formerly comprehended those provinces of Turkey and Persia, now called Diabekr and Erac Arabic it bordered east on Media, west on Mesopotamia, north on Armenia, and south on Arabia

Of the government, laws, religion, learning, customs, &c of the ancient Assyrians nothing absolutely certain is recorded. Their kingdom was at first small, and subsisted for several ages under hereditary chiefs, and their government was very simple. Afterward, when they rose to the sublimity of empire, their government seems to have been truly despotic, and the empire to have been hereditary. The division of the Assyrian empire into provinces and governments may be ascribed to Nimus, for we find (*Diod Sic lib ii*) that this institution was fully established in the reigns of Semiramis and her successors. In this empire the people were distributed into a certain number of tribes (*Herod lib i Strabo, lib xvi*), and their occupations or profession were hereditary. The Assyrians had several distinct councils, and several tribunals for the regulation of public affairs. As to their religion, they were idolaters, and had their idols at temples. In customs, arts, and learning, they differed but little from the Babylonians. They had one very curious practice with regard to marriage: all the girls who were marriageable were assembled in one place, and a public crier put them up to sale one after another. The money which was received for those that were handsome and fetched a high price, was bestowed as a portion upon those whose persons were more plain and homely. When the most beautiful were disposed of, the more ordinary were offered with a certain sum, and allotted to those who were willing to take them with the smallest portion. In this manner all the young women were provided with husbands. If at any time it happened that the parties could not agree, the man was obliged to refund the money which he had received. It was likewise very expressly forbidden to use females ill, or to carry them into any foreign country (*Herod lib i Strabo, lib xvi*). The Assyrians have been competitors with the Egyptians for the honour of having invented alphabetic writing. It appears from the few remains now extant of the writing of these ancient nations, that their letters had a great affinity with each other: they were nearly similar in shape, and both ranged in the same manner from right to left. *Plutarch's Chronol*



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p 67—70 Newton's Chronol ch in Apud Oper by Horsley, t v p 193—211

**ASSYRIAN** A native of Assyria

**ASSYRII** A name sometimes given to the Irvins and Phœnicians

**ASTA**, in ancient geography, a town of Liguria, or Piedmont, which was a Roman colony The present name is Asti

**ASTABAT** a town of Armenia in Asia This is the only place where the ronas, a root which dies a beautiful red, is produced Lat 38 28 N Lon 45 30 E

**ASTACUS FLUVIALIS** The official crab See **CANCER**

**ASTAROTH**, in mythology, an idol of the Philistines, which the Jews destroyed at the command of Samuel It was also the name of a deity of the Sidonians, which was worshipped by Solomon in his idolatrous days See **ASTARTE**

**ASTARTE**, in heathen mythology, a Phœnician goddess called the queen of heaven It is said the moon was adored under this name, others suppose her to be the goddess Juno, Cicero calls her the fourth Venus of the Assyrians, and Lucian, Europa, the daughter of Agenor She was sometimes represented holding a long wand with a cross upon the top of it Some medals represent her crowned with battlements and others with a crown of rays Suchomithon represents her with a cow's head, and in a medal struck at Cesarea, in Palestine, she is crowned with battlements, with a man's head in her right hand, and a staff in her left This goddess was originally no more than one of the Egyptian symbols, set up and joined with the several signs of the zodiac, to make known the different seasons, and it is plain, that from the different manner in which the Egyptian Isis was represented, a number of different goddesses were formed by other nations, and worshipped under different names

**ASTEISM**, in rhetoric, a genteel nonv or handsome way of denying another Such e g is that of Virgil Qui Baviuni non odit, amicitia carminum, Mævi, &c

**ASTELL** (Mary), was the daughter of an opulent merchant at Newcastle-upon-Tyne, where she was born about the year 1663 She was educated in a manner suitable to her station, and amongst other accomplishments, was mistress of the French, and had some knowledge of the Italian tongue Her uncle, a clergyman, observing in her some marks of a promising genius, took her under his tuition, and taught her mathematics, logic, and philosophy She left the place of her nativity when she was about twenty years of age, and spent the remaining part of her life at London and at Chelsea Here she pursued her studies with great assiduity, made great proficiency in the abovementioned sciences, and acquired a more complete knowledge of many classic authors Amongst these Seneca, Epictetus, Hierocles, Antoninus, Iuliy, Plato, and Xenophon, were her principal favourites

Her life is spent in waiting for the ad

## A S T

vancement of learning religion, and virtue, and in the practice of those religious duties which she so zealously and pathetically recommended to others, and in which perhaps no one was ever more sincere and devout Her sentiments of piety, charity, humility, friendship, and other Christian graces, were uncommonly refined and sublimed, and religion sat gracefully upon her, unattended with any forbidding airs of sourness or of gloom Her mind was generally calm and serene, and her conversation was innocently facetious and highly entertaining She would say, "The good Christian only hath reason, and he always ought to be cheerful, and," "That dejected looks and melancholy airs were very unseemly in a Christian" But these subjects she hath treated at large in some of her excellent writings

She was remarkably abstemious, and seemed to enjoy in uninterrupted state of health, till a few years before her death, when, having one of her breasts cut off, it so much impaired her constitution that she did not long survive it This painful operation she underwent without discovering the least timidity, or so much as uttering a groan, and showed the same resolution and resignation during her whole illness When she was confined to her bed by a gradual decay, and the time of her dissolution drew near she ordered her shroud and coffin to be made, and brought to her bedside, and there to remain in her view, as a constant memento of her approaching fate, and to keep her mind fixed on proper contemplation She died in the year 1731, in the 63d year of her age, and was buried at Chelsea She wrote, 1 A serious Proposal to the Indies 2 An Essay in Defence of the Female Sex 3 Letters concerning the Love of God 4 Reflections upon Marriage 5 Moderation truly stated 6 The Christian Religion, as professed by a Daughter of the Church of England and some other works

**ASTIF** Star wort, Michaelmas daisy a genus of the class and order syngenesia polygamia superflua Receptacle naked, down simple, florets of the margin more than ten, calyx imbricate, with the lower scales spreading More than a hundred species scattered over the globe They may be subdivided into those,

A more or less shrubby

B herbaceous, stem one or two-flowered

C leaves linear or lanceolate, entire

D leaves heart-shaped and ovate, serrate

E leaves ovate, entire

F leaves lanceolate, the lower more or less serrate

G leaves pinnate

Of these the only native species of our own country is the a tripolium, found occasionally on our muddy shores

See also **BUPHTHALMUM**, **CARPESIVUM**, **CHRYSANTHEMUM**, **SENECIO**

**ASTILBA** F, or **ASTRABAD**, the capitil

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of a province of the same name in Persia, Asia Lat 36 50 N Lon 55 35 E

**ASTERIAS** Star-fish sea-star A genus of the class vermes, order molusca Body depressed, covered with a coriaceous crust, mutilate with tentacula or tentacles, and grooved beneath mouth central, five-rayed Forty-five species dispersed through the different seas of the globe They are all marked with a rough white stony spot above they easily renew parts which have been lost by violence, and fix themselves to the bottom by swimming on the back and bending the rays They may be subdivided according to their forms, into

- A Lunate
- B Stellate
- C Radiate

It is suspected that the mischievous effects which at certain times of the year are produced by eating the common mussel, are occasioned by their having fed upon the a ophiura But the suspicion wants proof

The a eput medusæ is a curious sea-worm The five rays of which it is composed divide into two smaller ones, and each of these into two others, which mode of regular division is continued to a vast extent, gradually decreasing in size, till at length the ramifications amount to many thousands, forming a beautiful net-work Its colour is sometimes pale, or reddish-white, sometimes brown

**ASTERIAS**, in botany See **GFNTIANA**

**ASTERION**, in astronomy, one of the Canes venatici

**ASTERISK**, a character in form of a small star, set over any word or sentence to make it the more conspicuous, or to refer to the margin, or elsewhere, for a quotation, explanation, or the like The word is a diminutive of *αστηρ*, a star

**ASTERISM**, in astronomy, the same with constellation

**ASTERN** *ad* (from *a* and *stern*) In the hinder part of the ship, behind the ship (*Dryden*)

**ASTEROIDS** (from *αστηρ*, star, and *ειδος*, form) In astronomy, a name given by Dr Herschel to the new planets, or three small planetary bodies, discovered by the foreign astronomers Piazzi, Olbers, and Harding, which are defined as "celestial bodies either of little or considerable eccentricity round the sun, the plane of which may be inclined to the ecliptic in any angle whatever The motion may be direct or retrograde; and they may or may not have considerable atmospheres, very small comas, discs, or nuclei" To render feasible this notion of Ceres, Pallas, and Juno being bodies very different in their nature from either planets, or comets, and especially from the former, very limited definitions of them are given But all this is, in our opinion, very unnecessary, while it is indicative of a jealousy with regard to fame, unworthy of him who has discovered whole worlds And after all, the new term is by no means appropriate An asteroid is, from its derivation, a body resembling fixed stars but the

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newly-found heavenly bodies have no one circumstance in common with these luminaries

**ASTERT** *v a* To terrify, to startle, to fright (*Spenser*)

**ASTHENIA** (*asthema*, *ασθησια*, from *αστην* and *ενος*, strength) Extreme debility

**ASTHMA** (*asthema*, *ασθμα*, from *ασθμαζω*, to breathe with difficulty) Difficult respiration, returning at intervals, with a sense of stricture across the breast and in the lungs, a wheezing, hard cough at first, but more free towards the close of each paroxysm, with a discharge of mucus, followed by a remission It is ranked by Cullen in the class neurosis, and order spasmi There are three species of asthma 1 a spontaneous, when without manifest cause, 2 a plethoricum, when it arises from plethora, 3 a exanthematicum, originating from the repulsion of some humour See **MEDICINE**

**ASTHMATICAL ASTHMA'TICA** *a* (from *asthma*) Troubled with an asthma

**ASTI**, a city of Piedmont, situated near the rivers Barbo and Lanaro, and capital of a country called Astesan, or county of Asti The surrounding country is agreeable and fertile, interspersed with small hills, embellishing the seats of the nobility and gentry Asti was not generally known before the year 1103, when Alaric, king of the Goths, having been defeated by Sulico, the inhabitants of Asti, or the Romans, who held a garrison in that town, conducted thither the infants and wives of that prince, with the most precious of the spoil taken from him It is the see of a bishop, suffragan of the archbishop of Milan, erected in the year 265 Besides the cathedral, it contains upwards of thirty other churches, provincial and conventual Lat 44 50 N Lon 8 2 E

**ASTITES**, (from *ad*, and *sto*, to stand near) A name of the prostrate glands, so called from their proximity to the bladder

**ASTONIED** *particpal a* A word used for astonished (*Isaiah*)

To **ASTONISH** *v a* (*estonner*, Fr) To confound with fear or wonder, to amaze (*Adison*)

**ASTONISHINGNESS** *s* (from *astonish*) Quality to excite astonishment

**ASTONISHMENT** *s* (*estonnement*, Fr) Amusement, confusion of mind (*South*)

Astonishment, says Dr Cowan, is the kind and degree of wonder introduced by surprise, which, as it were, overwhelms or petrifies the soul The mental powers are in a stupor, in a state of stagnation High astonishment is the incubus of the mind, which feels nothing at the instant, so much as its inability to act This emotion always relates to things of the highest importance, to things which appear too vast and extensive for the grasp of intellect, rather than to intricacies When it relates to human conduct, astonishment is excited by great undertakings, or extensive projects, by the accomplishment of plans which appeared more than human, whether beneficial or destructive, or to some excess either of virtue or vice The

body marks in a striking manner the singular state of the mind that also becomes immovable, petrified as it were, or thunder-struck, which is the favorite expression in almost every language. The eyes are firmly fixed, without being directed to any particular object, the character of countenance which was formed by the habitual influence of some predominant affection, is for a time effaced, and a suspension of every other impression, a certain vacuity, strongly notes this singular suspension of mind.

Wonder and astonishment are expressions which, in many cases, may be used synonymously, as both causes and effects are very analogous for the intricacy attending an important subject, may be connected with its vastness, and sometimes occasioned by it. When these are introduced by surprise, that is, when subjects of the kind are suddenly and unexpectedly forced upon the attention, their united effects are extremely powerful, and they give an infinite momentum to their causes, whether they be of a pleasing or displeasing nature.

The term amazement, which is sometimes employed, seems to express a medium between wonder and astonishment. It is manifestly borrowed from the extensive and complicated intricacies of a labyrinth, in which there are endless mazes, without the discovery of a clue. Hence an idea is conveyed of more than simple wonder, the mind is lost in wonder. *Cogan*, p. 58.

To ASTOUND, *v a* (*astonner*, Fr.) To astonish, to confound with fear and wonder (*Milton*).

ASTRACAN, or ASTRACHAN, an episcopal city of Tartary, in Asia, and capital of a kingdom of the same name, which was conquered by Juri Basilowitz in 1554, and includes the north and part of the west sides of the Caspian Sea. From the harbour belonging to this town the Russians embark for Persia. The number of its inhabitants is about 70,000, and their principal trade is in salt and fish. Lat 46 22 N. Lon 47 40 E.

ASTRADGLE *ad* (from *a* and *straddle*) With one's legs across any thing.

ASTRÆA, in astronomy, one of the names of Virgo.

ASTRÆA, in mythology, the goddess of Justice, the daughter of Jupiter and Themis, and came down from heaven in the golden age, but when the manners of men became corrupt, she left the earth and returned to heaven.

ASTRAGAL, in architecture, from the Greek *αστραγάλος*, the *lone of the heel*, is a little round member, in form of a ring, or bracelet, serving as an ornament at the tops and bottoms of columns. The astragal is often cut into beads and berries.

ASTRAGAL, in gunnery, a round moulding encompassing a cannon, about half a foot from its mouth.

ASTRAGALUS, (*astragalus*, *αστραγάλος*, *a cockal*, or *die*, because it is shaped like the die used in ancient games.) In anatomy, a bone

of the tarsus, upon which the tibia moves. It is placed posteriorly and superiorly in the tarsus, and is formed of two parts, one large, which is called its body the other small, like a process. The part where these two unite is termed the neck.

ASTRAGALUS. In botany, liquorice vetch, milk vetch, a genus of the class and order diadelphia decandria. Legume mostly two celled, gibbous, seeds disposed in two rows. A hundred and seventy three species, which may be subdivided into those,

A with leafy stems, erect, flower axillary.

B spikes cylindric axillary, sessile or nearly so.

C stems leafy, erect, spikes and racemes peduncled.

D stems leafy, diffuse.

E leaflets, placed in whorls.

F scape naked with a leafy stem.

G shrubs or undershrubs with the petioles permanent and becoming spinous.

Three only are natives of our own country — A glycyphyllos wild liquorice, found in our woods — A hypoglottis, in our heaths — A uralensis in the mountains of Scotland. The last is recommended by some agriculturists as a good fodder for cattle.

The two following are medical plants. A excapus Stemless mill vetch. The root of this plant *astragalus excapus*, *acaulis excapus leguminibus lunatis, foliis villosis* of Imeneus is said to cure confirmed syphilis, especially when in the form of nodes and nocturnal pains. A tragacantha. The plant which affords the gum tragacanth. See TRAGACANTHA.

ASTRAL *a* (from *astrum*, Lat.) Starry, relating to the stars (*Dryden*).

ASTRANTIA Black masterwort, a genus of the class and order pentandria, digynia. Partial involucre lanceolate, spreading, equal, longer than the umbellet, coloured, florets of the ray abortive. Five species, chiefly natives of the Alps.

ASTRARIUS HÆRES, in law, is where an ancestor, by conveyance, has settled his heir apparent and family in a house in his lifetime.

ASTRAY, *ad* (from *a* and *stray*) Out of the right way (*Milton*).

To ASTRICTE *v a* (*astringo*, Latin) To contract by applications (*Arbutnot*).

ASTRICTION *s* (*astrictio*, Latin) The act or power of contracting the parts of the body by applications (*Bacon*).

ASTRICTIVL *a* (from *astrict*) Styp-tuck, of a binding quality.

ASTRICTORY *a* (*astrictorius*, Latin) Astringent, apt to bind.

ASTRIDE, *ad* (from *a* and *stride*) With the legs open (*Boyle*).

ASTRIFEROUS *a* (*astrifer*, Lat.) Bearing, or having stars.

To ASTRINGE *v a* (*astringo*, Lat.) To press by contraction, to make the parts draw together (*Bacon*).

ASTRINGENCY *s* (from *astringe*) The

power of contracting the parts of the body opposed to the power of relaxation (*Bacon*)

**ASTRINGENT** *a* (*astringens*, Lat) Binding; contracting (*Bacon*)

**ASTRINGENT PRINCIPLE**, in chemistry, a name given to the substance which exists chiefly in nutgalls, the bark of some trees, and in various plants, and the distinguishing property of which is astringency, or the power of contracting and hardening animal fibre, whether living or dead. Its effects are strikingly observable in the process of tanning. The property of forming a black precipitate with solutions of iron has been usually, though erroneously, given as one of the surest tests of astringency, but this belongs to the gallic acid, with which the astringent principle happens, in this and many other cases, to be united. The proper tests for this substance are, that it corrugates the tongue when tasted, giving a sensation of harshness and roughness to the palate, and its contracting effects upon any kind of animal jelly. The present name of this substance is **LANNEN**, under which term its properties will be more fully detailed.

**ASTRINGENT SAFFRON OF MARS**, or **RED OXYD OF IRON**, a reddish brown powder, not liable to be attracted by the loadstone, is formed by exposing filings of steel, or scales of iron, under a muffle.

**ASTRINGENTS** In medicine. See **AD-STRINGENTS**.

**ASTROGNOSIA** : The art of knowing the stars.

**ASTROGRAPHY** : (from *αστρον* and *γραφω*) The science of describing the stars.

**ASTROITES** See **HELMINTHOCEPHALUS**.

**ASTROIAL ABLE** *s* (of *αστρον*, and *αβηρ*, to take) The name for a stereographic projection of the sphere, either upon the plane of the equator the eye being supposed to be in the pole of the world, or upon the plane of the meridian when the eye is supposed in the point of the intersection of the equinoctial and horizon.

**ASTROLABE** is also the name of an instrument formerly used for taking the altitude of the sun or stars at sea.

**ASTROLABE**, among the ancients, was nearly the same as our armillary sphere.

**ASTROLOGER** *s* (*astrologus*, Lat) One that, supposing the influence of the stars to have a casual power, professes to foretell or discover events by those influences (*Smelt*).

**ASTROLOGIAN** *s* (from *astrology*) An astrologer (*Hudibras*).

**ASTROLOGICAL** **ASTROLOGICK** *a* (from *astrology*) : Possessing astrology (*Wotton*). *s* Relating to astrology (*Bentley*).

**ASTROLOGICALLY**, *ad* (from *astrology*) In an astrological manner.

**ASTROLOGIZE** *v n* (from *astrology*) To practise astrology.

**ASTROLOGY**, the art of foretelling future events from the positions, aspects, and influences of the heavenly bodies. The word is compounded of *αστρον*, star, and *λογω*, dis-

*course*, whence, in the literal sense of the term, astrology should signify no more than the doctrine or science of the stars. This indeed was its original acceptation, and constituted the ancient astrology, which consisted formerly of both the branches now called astronomy and astrology, under the name of the latter only, and for the sake of making judicary predictions it was, that astronomical observations, properly so called, were chiefly made by the ancients. And though the two branches are now perfectly separated, and that of astrology almost universally rejected by men of real learning, this has but lately been the case, as their union subsisted, in some degree, from Ptolemy till Kepler, who had a strong bias towards the ancient astrology.

Astrology may be divided into two branches, natural and judicary. To the former belongs the predicting of natural effects, such as the changes of weather, hurricanes, floods, earthquakes, &c. But this art properly belongs to physiology, or natural philosophy and is only to be deduced, a posteriori from phenomena and observations. Judicary or judicial astrology, which is what is commonly and properly called astrology, is that which professes to foretell moral events, or such as have a dependence on the free will and agency of man, as if they were produced or directed by the stars. This species of imposture, it is commonly said, was invented in Chaldaea and from thence transmitted to the Egyptian, Greeks, and Romans, though some insist that it was of Egyptian origin, and ascribe the invention to Chalm. But it is to the Arabs that we owe it.

**ASTROMETER**, the name given to a simple mechanical contrivance by means of which the rising and setting of the sun, stars, and planets, their positions in the heavens, &c. may be approximately ascertained. A new instrument of this kind has been lately devised by Dr David Brewster, for a description of which the reader to whom such a contrivance may be interesting, may consult the Philosophical Journal, No 70, or the Retrospect of Philosophical, &c Discoveries, No 10.

**ASTRONIUM** In botany, a genus of the class and order dicotyledonous pentandria. Calyx five-leaved, five petals. Mile nectary five glands in the disk. Fem styles three, seed one, lactescent. The only known species is a native tree of New Spain, secreting a gummy terahanthine juice, and ornamented with small red flowers.

**ASTRONOMER** *s* (from *αστρον* and *νομω*) One that studies the celestial motions, and the rules by which they are governed (*Loeke*).

**ASTRONOMICAL** **ASTRONOMICK** *a* (from *astronomy*) Belonging to astronomy (*Brown*).

**ASTRONOMICAL OBSERVATIONS** Of these there are records, or mention, in almost all ages. It is said that the Chinese have observations for a course of some thousand years. But of these, as well as those of the Indians, we have never yet had any benefit. But the

observations of most of the other ancients, as Babylonians, Greeks, &c amongst which those of Hipparchus make a principal figure, are carefully preserved by Ptolemy, in his *Almagest*. Our two countrymen Jer Horrox and Will Crabtree, are celebrated for their observations from the year 1635 to 1645, who first observed the transit of Venus over the Sun in the year 1639.—They were followed by Flamsteed, Cassini the father and son, Halley, de la Hire, Roemer, and Kirchius.—The observations of the celebrated Dr Bradley have not yet been published, though long expected. We have now published, from time to time, the accurate observations of the present British astronomer royal as also those of the French and other observatories, with the observations of many ingenious private astronomers, which are to be found in the *Transactions* and *Memoirs* of the various Philosophical Societies.—There have been also observations of many other eminent astronomers, as Galileo, Huygens, and our countryman Harriot, whose very interesting observations have lately been brought to light by the earl of Argemont and Count Brühl, by whose means they may come to be published. Other publications of celestial observations are those of Cassini, La Caille, Monnier, &c.

The late veteran astronomer M Jerome Lalande, in his *History of Astronomy* for the year 1801, has the following remarks on the subject of this article:—“The observations of Tycho, Flamsteed, Picard, La Caille, and Maskelyne have been the foundation on which the whole progress in the science of astronomy has been built: theories the most profound, calculations the most learned, will not surpass them, either in importance or duration. The observations alone will survive us, and observers, whom some would frequently attempt to deride, may console themselves, they will be the only astronomers to whom, long after their decease, hymns of praise and gratitude will be offered by our successors, and by posterity.”

**ASTRONOMICALLY** *ad* (from *astronomical*) In an astronomical manner

**ASIROMY** *αστρομια* A mixed mathematical science, teaching the knowledge of the celestial bodies, their magnitudes, motions, distances, periods, eclipses and order. The determination of the magnitudes, distances, &c of the heavenly bodies, and the orbits which such of them as are moveable describe is called pure or plain **ASTRONOMY**, and the investigations of the causes of their motions, and the laws by which they are regulated, is called physical **ASTRONOMY**.

#### *History of Astronomy*

The origin of the science of Astronomy has been ascribed to different persons, nations, and ages but on this head nothing can be accurately determined. Indeed, it is probable that mankind never existed without some knowledge of astronomy amongst them. For, besides the motives of mere curiosity, which are sufficient of themselves to have excited men to a contemplation of the glorious and varying celestial canopy, it is obvious that some parts of the science answer such essential purposes to mankind, as to make the cultivation of it a matter of indispensable necessity.

Accordingly we find traces of it, in different degrees of improvement, among all nations.

Josephus ascribes to Seth and his posterity a considerable knowledge of astronomy. He speaks of two pillars the one of stone and the other of brick, called the pillars of Seth, upon which they engraved the principles of the science, and he says that the former was still entire in his time. But be this as it may, it is evident that the great length of the antediluvian lives would afford such excellent opportunities for observing the heavenly bodies, that we cannot but suppose that the science of astronomy was considerably advanced before the flood. Indeed Josephus says, that longevity was bestowed upon them for the very purpose of cultivating the sciences of geometry and astronomy, observing that the latter could not be learned in less than 600 years, “for that period,” he adds, “is the grand year.” An expression remarkable enough, and by which it may be supposed is meant the period in which the sun and moon come again into the same situation in which they were at the beginning of it, with regard to the nodes, apogee of the moon, &c. “This period,” says Cassini, “of which we find no intimation in any monument of any other nation, is the finest period that ever was invented, for it brings out the solar year more exactly than that of Hipparchus and Ptolemy, and the lunar month within about one second of what is determined by modern astronomers.” If the Antediluvians had such a period of 600 years, they must have known the motions of the sun and moon more exactly than their descendants seem to have known them some ages after the flood.

Josephus also relates that “Abraham read lectures in astronomy and arithmetic to the Egyptians, which they understood nothing of till Abraham brought them from Chaldea to Egypt, and from thence they passed to the Greeks.” And Berosus observes, that “Abraham was a great and just man, and famous for his celestial observations.”

M Bailly in his elaborate history of ancient and modern astronomy, endeavours to trace the origin of this science among the Chaldeans, Egyptians, Persians, Indians, and Chineses, to a very early period. And thence he maintains, that it was cultivated in Egypt and Chaldea 2800 years before Christ, in Persia, 3209, in India, 3107, and in China 2952 years before that era. He also apprehends that astronomy had been studied even long before this distant period, and that we are only to date its revival from thence.

In investigating the antiquity and progress of astronomy among the Indians, M Bailly examines and compares four different sets of astronomical tables of the Indian philosophers, namely, that of the Siamese, explained by M Cassini in 1689; that brought from India by M le Gentil of the Academy of Sciences, and two other manuscript tables, found among the papers of the late M de Lisle, all of which he found to accord together, and all referring to the meridian of Benares, above-mentioned. It appears that the fundamental epoch of the Indian astronomy is a conjunction of the sun and moon, which took place at the amazing distance of 3102 years before Christ and M Bailly informs us that, by our most accurate astronomical tables, such a conjunction did really happen at that time. He farther observes that, at present, the Indians calculate eclipses by the mean motions of the sun and moon commencing at period 5000 years distant. The cycle of 19 years

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is also used by the Indians, and their astronomy agrees with modern discoveries as to the obliquity of the ecliptic, an acceleration of the motion of the equinoctial points, and many other respects. From the researches made into the knowledge of the Indians on these points, by Playfair, in the second volume of the Edinburgh Transactions, and several writers in the Asiatic Researches, it may be inferred that the fabulous accounts of the antiquity of the world, believed by the vulgar among the Hindoos, refer only to various periods assigned by their astronomers for the commencement of different calculations.

The solar year of the Brahmans of Tervalore is divided into 12 unequal months, each being equal to the time the sun occupies in moving through a sign; and in their calculations for a day, they employ the time the sun moves  $1^{\circ}$  in the ecliptic. Their sidereal year consists of  $365^d 6^h 12^m 30^s$  and the tropical of  $365^d 5^h 50^m 35^s$ . They assign inequalities to the motions of the planets, answering very well to the annual parallax, and the equation of the centre.

Most authors, however, fix the origin of astronomy and astrology, either in Chaldea or in Egypt; and accordingly among the ancients we find the word Chaldean often used for astronomer, or astrologer. Indeed both of these nations pretended to a very high antiquity, and claimed the honour of producing the first cultivators of this science. The Chaldeans boasted of their temple on tower of Belus, and of Zoroaster, whom they placed 5000 years before the destruction of Troy, while the Egyptians boasted of their colleges of priests, where astronomy was taught, and of the monument of Osymandyas, in which, it is said, there was a golden circle of 365 cubits in circumference, and one cubit thick, divided into 365 equal parts according to the days of the year, &c.

Diodorus Siculus informs us that "the southern parts of Arabia are made up of sandy plains of a prodigious extent, the travellers through which direct their course by the bears in the same manner as is done at sea." It appears, therefore, that the inhabitants were acquainted with some of the constellations. He farther observes that the Chaldeans made the annual motion of the sun oblique to the equator, and contrary to the daily motion. The Chaldeans made 36 constellations, twelve in the zodiac, and 24 out of it. They also made an observation on Saturn in the year 228 A. C. which is preserved by Ptolemy, and it appears to be the only one which they made on the planets. Mr E. Barnard says (Phil. Trans. No. 158) that the Egyptians discovered very early, that the stars had an annual motion of  $50'' 9''' 45''$  in a year. And, according to Macrobius, the Egyptians made the planets revolve about the sun in the same order as we do, but it does not appear at what time the planets were discovered.

From Chaldea and Egypt the science of astronomy passed into Phœnicia, which this people applied to the purposes of navigation, steering their course by the north polar star, and hence they became masters of the sea, and of almost all the commerce in the world.

The Greeks, it is probable, derived their astronomical knowledge chiefly from the Egyptians and Phœnicians, by means of several of their ambassadors who visited these nations, for the purpose of learning the different sciences. Newton conjectured that most of the constellations were discovered about the time of the Argonautic expedition; but it is more probable that they were

at least most part of them, of a much older date, and derived from other nations, though clothed in fables of their own invention or application. Several of the constellations are mentioned by Hesiod and Homer, the two most ancient writers among the Greeks, and who lived about 870 years before Christ. Their knowledge in this science however was greatly improved by Philes the Milesian, and other Greeks, who travelled into Egypt, and brought from thence the chief principles of the science. Thales was born about 640 years before Christ, and he, first of all among the Greeks, observed the stars, the solstices, the eclipses of the sun and moon, and predicted the same. And the same was further cultivated and extended by his successors Anaximander, Anaximanes, and Anaxagoras, but most especially by Pythagoras, who was born 577 years before Christ, and having resided for several years in Egypt, &c. brought from thence the learning of these people, taught the same in Greece and Italy, and founded the sect of the Pythagoreans. He taught that the sun was in the centre of the universe, that the earth was round, and people had antipodes, that the moon reflected the rays of the sun and was inhabited like the earth, that comets were a kind of wandering stars, disappearing in the further parts of their orbits, that the white colour of the milky way was owing to the united brightness of a great multitude of small stars, and he supposed that the distances of the moon and planets from the earth were in certain harmonic proportions to one another.

Philolaus, a Pythagorean, who flourished about 470 years before Christ, ascribed the annual motion of the earth about the sun, and not long after, the diurnal motion of the earth on her own axis was taught by Hicetas, a Syracusan. About the same time flourished at Athens, Meton and Euctemon, where they observed the summer solstice 432 years before Christ, and observed the risings and settings of the stars, and what seasons they answered to. Meton also invented the cycle of 19 years, which still bears his name.

Eratosthenes, who was born at Cyrene in the year 271 before Christ, measured the circumference of the earth by means of a gnomon, and being invited to Alexandria, from Athens, by Ptolemy Evergetes, and made keeper of the royal library there, he set up for that purpose those armillary spheres, which Hipparchus and Ptolemy the astronomer afterwards employed so successfully in observing the heavens. He also determined the distance between the tropics to be  $\frac{1}{4}$  of the whole meridian circle, which makes the obliquity of the ecliptic in his time to be  $23^{\circ} 51'$ . The celebrated Archimedes, too, cultivated astronomy as well as geometry and mechanics, he determined the distances of the planets from one another, and constructed a kind of planetarium or orrery, to represent the phenomena and motions of the heavenly bodies.

To pass by several others of the ancients, who practised or cultivated astronomy, more or less, we find that Hipparchus, who flourished about 140 years before Christ, was the first who applied himself to the study of every part of astronomy, and, as we are informed by Ptolemy, made great improvements in it. He discovered that the orbits of the planets are eccentric, that the moon moved slower in the apogee than in her perigee, and that there was a motion of anticipation of the moon's nodes. He constructed tables of the motions of the sun and moon, collected accounts of such eclipses,



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&c. as had been made by the Egyptians and Chaldeans, and calculated all that were to happen for 600 years to come. He discovered that the fixed stars changed their places, having a slow motion of their own from west to east: he corrected the Calippic period, and pointed out some errors in the method of Eratosthenes for measuring the circumference of the earth. He computed the sun's distance more accurately than any of his predecessors, but his chief work is a catalogue which he made of the fixed stars, to the number of 1022, with their longitudes, latitudes, and apparent magnitudes, which, with most of his other observations, are preserved by Ptolemy in his *Almagest*.

There was but little progress made in astronomy from the time of Hipparchus to that of Ptolemy, who was born at Pelusium in Egypt in the first century of christianity, and who made the greatest part of his observations at the celebrated school of Alexandria in that country. Profiting by those of Hipparchus, and other ancient astronomers, he formed a system of his own, which, though erroneous, was followed for many ages by all nations. He compiled a great work, called the *Almagest*, which contained the observations and collections of Hipparchus and others his predecessors in astronomy, on which account it will ever be valuable to the professors of that science. His work was preserved from the grievous conflagration of the Alexandrine library by the Saracens, and translated out of Greek into Arabic in the year 827, and from thence into Latin in 1230.

During the long period from the year 800 till the beginning of the 14th century, the western parts of Europe were immersed in gross ignorance and barbarity, while the Arabians, profiting by the books they had preserved from the wreck of the Alexandrine library, cultivated and improved all the sciences, and particularly that of astronomy, in which they had many able professors and authors. The caliph Al Mansur first introduced a taste for the sciences into his empire. His grandson Al Mamun, who ascended the throne in 814, was a great encourager and improver of the sciences, and especially of astronomy. Having constructed proper instruments, he made many observations, determined the obliquity of the ecliptic to be  $23^{\circ} 35'$ , and under his auspices a degree of the circle of the earth was measured a second time in the plain of Singar, on the border of the Red Sea. About the same time Alferganus wrote elements of astronomy, and the science was from hence greatly cultivated by the Arabians, but principally by Albategnius, who flourished about the year 880, and who greatly reformed astronomy, by comparing his own observations with those of Ptolemy: hence he computed the motion of the sun's apogee from Ptolemy's time to his own, settled the precession of the equinoxes at one degree in 70 years, and fixed the obliquity of the ecliptic at  $23^{\circ} 35'$ . The tables which he composed, for the meridian of Aracta, were long esteemed by the Arabians. After his time, though the Saracens had many eminent astronomers, several centuries elapsed without producing any very valuable observations, excepting those of some eclipses observed by Ebn Yoonis, astronomer to the caliph of Egypt, by means of which the quantity of the moon's acceleration since that time may be determined.

Other eminent Arabic astronomers were, Arzachel a Moor of Spain, who observed the obliquity of the ecliptic: he also improved Trigonometry

by constructing tables of sines, instead of chords of arches, dividing the diameter into 800 equal parts. And Albaten, his contemporary, who wrote upon the twilight, the height of the clouds, the phenomenon of the horizontal moon, and who first shewed the importance of the theory of refractions in astronomy.

The settlement of the Moors in Spain introduced the sciences into Europe, from which time they have continued to improve, and to be communicated from one people to another, to the present time when astronomy and all the sciences have arrived at a very eminent degree of perfection. The emperor Frederick II, about 1230, first began to encourage learning, restoring some decayed universities, and founding a new one in Vienna. He also caused the works of Aristotle, and Ptolemy's *Almagest*, to be translated into Latin, and from the translation of this work we may date the revival of astronomy in Europe. Two years after this, John de Sacro Bosco, that is, of Halifax, compiled, from Ptolemy, Albategnius, Alferganus, and other Arabic astronomers, his work *De Sphæra*, which was held in the greatest estimation for 300 years after, and was honoured with commentaries by Clavius and other learned men. In 1240, Alphonso, king of Castile, not only cultivated astronomy himself, but greatly encouraged others, and by the assistance of several learned men he corrected the tables of Ptolemy and composed those which were denominated from him the Alphonsine Table. About the same time also Roger Bacon, an English monk, wrote several tracts relative to astronomy, particularly of the lunar aspects, the solar rays, and the places of the fixed stars. And, about the year 1270, Vitello, a Polander, composed a treatise on optics in which he shewed the use of refractions in astronomy.

Little other improvement was made in astronomy till the time of Purbach, who was born in 1423. He composed new tables of sines for every 10 minutes, making the radius 60, with four ciphers annexed. He constructed spheres and globes, and wrote several astronomical tracts, as, a commentary on Ptolemy's *Almagest*, some treatises on arithmetic and dialling, with tables for various climates, new tables of the fixed stars reduced to the middle of that century, and he corrected the tables of the planets, making new equations to them where the Alphonsine tables were erroneous. In his solar tables, he placed the sun's apogee in the beginning of Cancer, but retained the obliquity of the ecliptic  $23^{\circ} 33'$ , as determined by the latest observations. He also observed some eclipses, made new tables for computing them, and had just finished a theory of the planets, when he died in 1462, being only 39 years of age.

After Purbach the subject of astronomy was much cultivated by John Muller, commonly called Regiomontanus. His labours were succeeded by those of Bernard Walther, and Walker was followed by John Werner, a clergyman, at Nuremberg, &c.—he shewed that the motion of the fixed stars, since called the precession of the equinoxes, was about  $1^{\circ}$  in 100 years.

But Nicolaus Copernicus was the next who made any considerable figure in astronomy. About the year 1507 he conceived doubts of the Ptolemaic system, and entertained notions about the true one, which he gradually improved by a series of astronomical observations, and the contemplation of former authors. By these he formed



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new tables, and completed his work in the year 1530, containing these, and a renovation of the *trig. system* of the universe, in which all the planets are considered as revolving about the sun, placed at the centre. See *COPERNICUS*.

After the death of Copernicus, the science and practice of astronomy were greatly improved by Schöner, Nozius, Appian, Gemma Frisius, Byrgius, &c.

About the year 1561, William IV. landgrave of Hesse Cassel, applied himself to the study of astronomy, and with the best instruments which could then be procured made a great number of observations, published by Snelius in 1618, and preferred by Hevelius to those of Tycho Brahe. From these observations he formed a catalogue of 400 stars, with their latitudes and longitudes, adapted to the beginning of the year 1593.

Tycho Brahe, a noble Dane, began his observations about the same time with the landgrave of Hesse, and observed the great conjunction of Jupiter and Saturn but finding the usual instruments very inaccurate, he constructed many others much larger and exacter. In 1571 he discovered a new star in the chair of Cassiopeia, which induced him, like Hipparchus on a similar occasion, to make a new catalogue of the stars, which he composed to the number of 777, and adapted their places to the year 1600. In the year 1576, by favour of the king of Denmark, he built his new observatory, called Uraniburg, on the small island Hvenna, opposite to Copenhagen which he very amply furnished with many large instruments, some of them so divided as to show single minutes, and in others the arch might be read off to 10 seconds. Tycho invented a system to account for the planets motions. See *TYCHONIC*. But he is more to be noted on account of his accurate observations, which tended much to the discovery of the real nature of the planetary orbits.

While Tycho resided at Prague with the emperor, he prevailed on Kepler to leave the university of Glatz, and to come to him, and Tycho dying in 1601 Kepler enjoyed all his life the title of mathematician to the emperor, who ordered him to finish the tables of Tycho Brahe, which he published in 1627, under the title of *Rodolphine*. He died about the year 1630, at Ratsbon, where he was soliciting the arrears of his pension. From his own observations and those of Tycho, Kepler discovered several of the true laws of nature, by which the motions of the celestial bodies are regulated. He discovered that all the planets revolve about the sun, not in circular, but in elliptical orbits, having the sun in one of the foci of the ellipse, that their motions are not equable, but varying quicker or slower, as they are near to the sun or farther from him, that the areas described by the variable line drawn from the planet to the sun are equal in equal times, and always proportional to the times of describing them. He also discovered, by trials, that the cubes of the distances of the planets from the sun were in the same proportion as the squares of their periodical times of revolution. By observations also on comets, he concluded that they are really carried about among the orbits of the planets, in paths that are nearly rectilinear, but which he could not then determine. See *Dr. Halley's Discoveries of Kepler*.

Some much was done by Wright, Flamsteed, &c. To Napier we owe some curious and improvements in spherics,

besides the ever memorable invention of logarithms. \* Bayer, a German, published his *Uranometria*, or the figures of all the constellations visible in Europe, with the stars marked on them, and accompanied by names or the letters of the Greek alphabet, a contrivance by which they may easily be referred to with distinctness and precision. About the same time too, astronomy was cultivated abroad by Mercator, Mauricius, Maginus, Homelius, Schultze, Stevin, Galileo, &c. and in England by Thomas and Leonard Digges, John Dee, Robert Flood, Harriot, &c.

The beginning of the 17th century was particularly distinguished by the invention of telescopes, and the application of them to astronomical observations. The more distinguished early observations with the telescope were made by Galileo Harriot, Huygens Hook, Cassini, &c. It is said that, from report only, Galileo made for himself telescopes, by which he discovered inequalities in the moon's surface, Jupiter's satellites, and the ring of Saturn, also spots on the sun by which he found out the revolution of that luminary on its axis, and he discovered what was merely supposed by Pythagorus, that the nebulae and milky-way were full of small stars. Harriot also, hitherto known only as an algebraist, made much the same discoveries as Galileo, and as early, if not more so, as appears by his papers, not yet printed, in the possession of the earl of Egremont.

Hevelius, from his own curious observations furnished a catalogue of fixed stars, much more complete than Tycho's. Huygens and Cassini discovered the satellites of Saturn and his ring. And Gassendi, Horrox Bullialdus, Ward, Ricciohus Gascoign, &c. each contributed very considerably to the improvement of astronomy.

The immortal Newton first demonstrated, from physical considerations, the great law that regulates all the heavenly motions, sets bounds to the planets' orbits, and determines their greatest excursions from the sun, and their nearest approaches to it. It was he who first taught the world whence arose that constant and regular proportion observed by both primary and secondary planets, in their circulation round their central bodies, and their distances compared with their periods. He has also given us a new theory of the moon, which accurately answers all her inequalities, and accounts for them from the laws of gravity and mechanism.

Mr Flamsteed was appointed the first astronomer royal at Greenwich in 1675. He observed for 44 years all the celestial phenomena, the sun, moon, planets, and fixed stars, of all which he gave an improved theory and tables, viz. a catalogue of 3000 stars with their places, to the year 1689, also new solar tables, and a theory of the moon according to Horrox, likewise, in Sir John Moore's *System of Mathematics*, he gave a curious tract on the doctrine of the sphere, shewing how, geometrically, to construct eclipses of the sun and moon, as well as occultations of the fixed stars by the moon. And it was upon his tables that were constructed both Halley's tables, and Newton's theory of the moon—Cassini also, the first French astronomer royal, very much distinguished himself, making many observations on the sun, moon, planets and comets, and greatly improved the elements of their motions. He also erected the gnomon, and drew the celebrated meridian line in the church of Petronia at Bologna.

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In 1719, Flamsteed was succeeded by Dr Halley, who oblige the world with the astronomy of comets, and with a catalogue of the stars in the southern hemisphere, and was a very great benefactor to astronomy by his observations to which may be added that he printed a new set of astronomical tables, more accurate than any before published. He recommended the method of determining the longitude by the moon's distances from the sun and certain fixed stars, a method which had before been noticed and which has since been carried into execution.

About this time a dispute arose concerning the figure of the earth. Newton had determined from a consideration of the laws of gravity, and the diurnal motion of the earth, that the figure of it was an oblate spheroid, and flattened at the poles; but Cassini, from the measures of Picart, supposed it to be an oblong spheroid or lengthened at the poles. To settle this dispute, it was resolved, under Lewis XV. to measure two degrees of the meridian, one near the equator, and the other as near the pole as possible. For this purpose, the Royal Academy of Sciences sent to Ireland, Maupertuis, Clairault, Camus, and Le Monnier, who were accompanied by Outhier, and Celsius, professor of anatomy at Upsal. On the southern expedition were sent Godin, Condamine and Bouguer, to whom the king of Spain joined George Juan and Antonio de Ulloa. These set out in 1735, and returned at different times in 1744, 1745 and 1746, but the former party, who set out only in 1736, returned the year following, having both fulfilled their commissions. Picart's measure was revised by Cassini and De la Caille, which after his errors were corrected, was found to agree very well with the other two, and the result of the whole served to confirm the determination of the figure before laid down by Newton. On the southern expedition, the attraction of the great mountains of Peru was found to have a sensible effect on the plumb line of one of their largest instruments, deflecting it seven or eight seconds from the true perpendicular. See DEGREE and EARTH.

On the death of Halley, in 1742, he was succeeded by Bradley, as astronomer royal at Greenwich. The accuracy of his observations enabled him to detect the smaller inequalities in the motions of the planets and fixed stars. The consequence of this accuracy was, the discovery of the aberration of light, the nutation of the earth's axis, and a much greater degree of perfection in the lunar tables.

Bradley was succeeded in 1762, in his office of astronomer royal, by Bliss, Savilian professor of astronomy, who being in a declining state of health, did not long enjoy it. In 1765, he was succeeded by Nevil Maskelyne, the present excellent astronomer royal, who, in January 1761, was sent by the Royal Society, at a very early age to the island of St Helena, to observe the transit of Venus over the sun, and the parallax of the star Sirius. The first of these objects partly failed, by clouds preventing the sight of the second internal contact, and the second also, owing to Short having suspended the plumb line by a loop from the neck of the central pin. However our astronomer indemnified himself by many other valuable observations; thus, he observed at St Helena, the tides, the horary parallaxes of the moon, and the going of a clock, to find, by comparison with its previous going which had been observed in England, the difference of gravity at

the two places also in going out and returning, he practised the method of finding the longitude by the lunar distances taken with Hadley's quadrant, making out rules for the use of seamen, and teaching the method to the officers on board the ship, which was explained in the Philosophical Transactions for the year 1762, and more fully afterwards in the British Mariner's Guide published in the year 1763. In September 1763, he sailed for the island of Barbadoes, to settle the longitude of the place, to examine Harrison's watch, and to try Irwin's marine chair. While at Barbadoes, he made many other observations, and amongst them, many relating to the moon's horary parallaxes, not yet published. Returning to England in the latter part of the year 1764, he was appointed in 1765 to succeed Bliss, and immediately recommended to the Board of Longitude the lunar method of finding the longitude, and proposed to it the project of a nautical almanac, to be calculated and published to facilitate that method. This it agreed to, and the first volume was published for 1767 and has continued ever since under his direction, to the great benefit of navigation.

In consequence of a proposal made by this astronomer to the Royal Society, the project was formed of measuring accurately the effect of some mountain on the plumb line, in deflecting it from the perpendicular, and Schehallien in Scotland, having been found the most convenient in this island for the purpose, he went into Scotland to conduct the business, by which experiment he shewed, that the sum of the deflections on the two opposite sides was about  $11\frac{1}{2}$  seconds of a degree, and proved, to the satisfaction of the whole world the universal attraction of matter. From the data resulting from these measures Dr Hutton has computed the mean density of the whole matter in the earth, to be about  $4\frac{1}{2}$  times that of common water.

The discoveries of Herschel, Piazzi, Harding, and Olbers, form a new æra in astronomy. The former of these gentlemen, by his great skill in the construction of large specula, has made telescopes which have opened new views of the heavens and unfolded scenes which excite no less our wonder than our admiration. On the 13th of March 1781 he discovered a new primary planet called by him Georgium Sidus, but named the planet Herschel, or Uranus, by foreign astronomers. This planet there is reason to believe, was seen by Flamsteed in 1690, by Mayer in 1756, and by Monier in 1769, but to Herschel was reserved the honour of discovering that it was a primary planet belonging to the solar system. He has also discovered six satellites belonging to this planet, and two more belonging to Saturn, thus has he discovered nine bodies in our system.

And M. Piazzi, astronomer royal, at Palermo, discovered on January 1, 1801, the first day of the 19th century, another planet moving in an intermediate orbit between Mars and Jupiter. It had been long conjectured by Maclaurin, Baxter, Lambert, Bode, Zach, and others, that there was an intermediate primary planet between Mars and Jupiter, and the discovery has coincided with some of these conjectures in a very extraordinary manner. This planet is now distinguished by the name Ceres Ferdinandia. Another new and small planet was discovered by Dr Olbers of Bremen, on the 28th of March, 1802, it is called Pallas, and is distant from the sun about the same as Ceres, their orbits, indeed, intersecting each

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other Juno is likewise another very small planet discovered by M. Harding, at Lilienthal, on the 1st of September, 1804, it is a little farther distant from the sun than Ceres and Pallas. A fourth of these small planetary bodies was discovered by Dr. Olbers, early in 1807 it is now known by the name of Vesta. Indeed we think it highly probable, that as astronomical instruments are improved, and astronomers become more vigilant in their observations, new discoveries of this kind will be made, and our system will be enlarged by the discovery of planets making their excursions beyond the orbit of Georgium Sidus, and some, it is likely, even within the orbit of Mercury, for, if we consider the comparative magnitude of the orbits, it will appear probable, that a spectator at Saturn would see none of the inferior planets except Jupiter, whose greatest elongation from the sun would be about  $37^{\circ}$ ,—Mars would only be seen sometimes when transiting the sun's disc thus, also a spectator at Jupiter would scarcely ever see Venus, one at Mars would probably never see Mercury but when transiting the sun's disc, and in like manner planets below Mercury have hitherto eluded the vigilance of all our observers. But we look forward to fresh discoveries with confidence for the increasing zeal and activity of astronomers in every part of Europe will surely be crowned with success and benefit.

Before we conclude this history, we must notice the principal labours of scientific men in regard to physical astronomy. Among these the most distinguished names after Newton are, Maclaurin, Clairaut, T. Simpson, Walmesley, Euler, D. Alembert, Frisi, Lagrange, Lalande, and Laplace. Simpson, in his tracts, directed his attention to the theory of the moon. He shewed that the effects of such forces as are proportional to the cosine of an arch  $z$ , are explicable, by means of the cosines of that arch and of its multiples, and thus determined a very important point for, since it hence appears, that no terms enter into the equation of the moon's orbit, but what by a regular increase and decrease, do after a certain time return to their former values, it is therefore evident that the mean motion, and the greatest quantities of the several equations, undergo no change from gravity. Frisi, in his *Cosmographia*, applied a similar mode of reasoning to the variations of the obliquity of the ecliptic, which he thus shewed to be confined within certain limits. Laplace was conducted farther in the general movement of a system of bodies, such as is actually exemplified in nature, every thing is in motion, not only every body, but the plane of every orbit. The mutual action of the planets changes the positions of the planes in which they revolve, and they are perpetually made to depart by a small quantity, on one side or other, each from that plane in which it would go on continually, if their mutual action were to cease. The calculus of Laplace, in the first book of his *Mécanique Céleste*, makes it appear, that the inclinations of these orbits in the planetary system are stable, or that the planes of the orbits oscillate a little, to and fro, on each side of a fixed and immovable plane. This plane is shewn to be one, on which, if every one of the bodies of the system be projected, a perpendicular let fall from it, and if the sum of each body be multiplied into the sine described in a given time by the said plane, the sum of all will be a maximum.

problem of the three bodies,

engaged in succession the attention of many eminent philosophers. The problem is thus having given the masses of three bodies projected from three points given in position, with velocities given in their quantity and direction, and supposing the bodies to gravitate to one another with forces that are as their masses directly and the squares of their distances inversely, to find the lines described by those bodies, and their position, at any given instant or, the problem may be rendered still more universal, by supposing the number of bodies to exceed three. To resolve the problem generally, according to either of these enunciations, exceeds the powers even of the most refined analysis but under the conditions with which nature presents it to us, much has been done by Clairaut, D. Alembert, Euler, and others. Clairaut was the first who deduced from his solution of the problem, a complete set of lunar tables, of an accuracy far superior to any thing that had yet appeared, and which when compared with observation, gave the moon's place, in all situations very near the truth. Their accuracy, however was exceeded by another set produced by Tobias Mayer of Gottingen and grounded on a comparison of Euler's solution with correct observations. The problem of finding the longitude at sea, which was now understood to depend so much on the exactness with which the moon's place could be computed, gave great additional value to these researches, and established a very close connection between the conclusions of theory and the art of navigation. Mayer's tables were rewarded by the Board of Longitude in England, and Euler's, at the suggestion of Turgot, by the Board of Longitude in France.

Thus, the lunar theory was brought to a very high degree of perfection, and the tables constructed by means of it were found to give the moon's place true to 30 seconds. Still, however, there was one inequality in the moon's motion for which the principles of gravitation seemed to afford no account this was what is known by the name of the moon's acceleration. Various attempts were made to explain the phenomenon by Halley, and others it was, at length, satisfactorily elucidated by Laplace, who thus gave the finishing touch to the theory of the moon, nearly a century after it had been propounded in the first edition of the *Principia*. See ACCELERATION OF THE MOON.

That branch of the theory of disturbing forces which relates to the action of the primary planets on one another, was successfully cultivated between 1740 and 1780. In the course of these researches, the change in the obliquity of the ecliptic before adverted to, came first to be perfectly recognised, and ascribed to the action of the planets, on the earth. Euler proved, independently of Frisi, that the change in this obliquity is periodical, that it is not a constant diminution, but a small and slow oscillation never exceeding two degrees altogether on both sides of a mean quantity, by which it alternately increases and diminishes in the course of periods which are not all of the same length, but by which, in the course of ages, a compensation ultimately takes place.

Lagrange, struck with the circumstance that the calculus had never given any inequalities but such as were periodical, applied himself to the investigation of a general question, from which he found by a method peculiar to himself and independent of any approximation, that the in-

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equilities produced by the mutual action of the planets must in effect be all periodical, that the periodical changes are confined within narrow limits, that none of the planets ever has been or ever can be a comet moving in a very eccentric orbit, but that the planetary system oscillates as it were round a medium state from which it never deviates far, that amid all the changes which arise from the mutual actions of the planets, two things remain perpetually the same, viz the length of the greater axis of the ellipse which the planet describes, and its periodical time round the sun, or, which is the same thing, the mean distance of each planet from the sun and its mean motion remain constant. The plane of the orbit varies, the species of the ellipse and its eccentricity change, but never, by any means whatever, the greater axis of the ellipse, or the time of the entire revolution of the planet. The discovery of this great principle, which we may consider as the bulwark that secures the stability of our system, and excludes all access to confusion and disorder, must render the name of Lagrange for ever memorable in science, and ever revered by those who delight in the contemplation of whatever is excellent and sublime. After Newton's discovery of the elliptic orbits of the planets from gravitation, Lagrange's discovery of their periodical inequalities is, without doubt, the noblest truth in physical astronomy, and in respect of the doctrine of final causes, it may truly be regarded as the greatest of all.

Newly allied to this truth is the following theorem resulting from one of Laplace's investigations. If the mass of each planet be multiplied into the square of the eccentricity of its orbit, and this product into the square root of the axis of the same orbit, the sum of all these quantities, when they are added together, will remain forever the same. This sum is a constant magnitude, which the mutual action of the planets cannot change. Hence, no one of the eccentricities can ever increase to a great magnitude, for, as the mass of each planet is given, as well as its axis, the square of the eccentricity in each is multiplied into a given coefficient, and the sum of all the products so formed is incapable of change. Here, therefore, we have another general property indicating the stability of our system within narrow limits. Yet it does not follow that this permanency is necessary and unavoidable, under every possible constitution of the planetary orbits; for, if the planets did not all move the same way, if their orbits were not all nearly circular, if their eccentricities were not small, or, if the law of planetary deflection were different, the permanency of the preceding quantity could not take place. Such permanency depends upon conditions which are not necessary in themselves, and is therefore an argument of design in the construction of the universe.

The subject of the tides is another, the true theory of which was sketched by Newton, but not completed till long after his time. The state of neither mechanical nor mathematical science was such in his time as would enable any one to determine the motions of a fluid, acted upon by three gravitations, and having besides a rotatory motion. The dissertations of D Bernoulli, Euler, and Maclaurin, which shared the prize with that of P. Cavalieri on the principle of vortices, were admirable, but the first man who felt himself in possession of all the principles required in this arduous investigation was Laplace, who, in the

years 1775, 1779, and 1790 communicated to the Academy of Sciences a series of memoirs on this subject, which he has united and extended in the fourth book of the *Mécanique Céleste*. See *Times*. See also Edinburgh Review No. 22.

The precession of the equinoxes is another interesting subject, to which the attention of Frisi, Walsley, T. Simpson, D'Alembert, Landen, Milner, M. Young, and Robertson, have been successively directed. We have not room to give an account of their labours here, but shall rather beg leave to return for a moment to the consideration of the provision made for the permanency of the planetary system. Is it necessary, or is it contingent, the effect of an unavoidable, or of an arbitrary arrangement? If the conditions be not necessary, but the result of an arrangement that might have been different, we are then entitled to conclude that it is the effect of wise and benevolent design, exercised in the construction of the universe. Now this permanency of the system within very narrow limits of deviation from its present state, depends, as we have seen, principally on the law of planetary deflection. Had it been directly or inversely as the distance, the deviations would have been such as to have quickly rendered it wholly unfit for its present purposes. They would have been very great had the planetary orbits differed much from circles, nay, had some of them moved in the opposite direction. The selection of this law, this form of the orbits, and a direction the same way, strikes the mind of a Newton, and indeed any heart possessed of sensibility to moral or intellectual excellence, as a mark of wisdom prompted by benevolence. Yet M. Laplace, and others, as it infected with a kind of rheumatism, are eager to point it out as a mark of fatalism. They say, that it is essential to all qualities that are diffused from a centre to diminish in the inverse duplicate ratio of the distance. But this is very erroneous, stated thus generally: it is a mere geometrical conception. We indeed say, that the density of illumination decreases in this proportion, but who says that this is a quality? Whether it be considered as the emission of luminous corpuscles, or in undulation of an elastic fluid, it is not a quality emanating from a centre, and even in this estimation it seems gratuitous, whether we shall consider the base of the luminous pyramid, or its whole contents, as the expression of the quantity. Nay, if all qualities must diminish at this rate, all action *à distance* must do the same, for when the distances bear any great proportion to the diameters of the particles, their action decays insensibly from this law, and is perceived only by the accumulation of its effects after a long time.

But we are wandering from the direct purpose of this article: the great and deserved celebrity of Laplace must plead our apology for this digression. We highly admire and warmly recommend his *Celestial Mechanics*, but we sincerely regret that his profound investigations should, through some strange propensity, have led him to the conclusion above animadverted upon, instead of cherishing that disposition of the human heart which prompts us to see contrivance wherever we see a nice and refined adjustment of means to ends, and from the admirable beauty of the solar system, to exclaim,

"These are thy glorious works, Parent of good!  
Almighty, thine this universal frame,

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Thus wond'rous fair; thyself how wond'rous  
then!

Unspeakable, who sitt'st above these heavens,  
To us invisible, or dimly seen  
In these thy lowest works, yet these declare  
Thy goodness beyond thought, and power divine."

MILTON

The modern writers upon the subject of astronomy are very numerous besides those whose names are mentioned in the preceding history, the most noted and esteemed books are by the following authors Biot, Bonnycastle La Caille, Emerson, Ferguson, D Gregory, O Gregory, Keill, Lalande, Leadbetter, Long, Street, Vince, Wing, Whiston, and Woolsey Of these, the works of Biot, Bonnycastle, Ferguson, and Woolsey, are entertaining popular introductions to the study of astronomy The others are of a more scientific complexion Each has its peculiar merits but the large performances of De Lalande and Professor Vince, are by far the most complete and extensive De Lalande's System of Astronomy is invaluable it has probably tended more to the general promotion of the science, than all the other works which ever appeared upon the subject And Professor Vince's System is certainly the most extensive and useful body of information on this science which has yet been published in Britain

## INTRODUCTION TO ASTRONOMY

The world, according to the vulgar opinion, is composed of two principal parts, the earth and the sky The earth appears to be a vast surface nearly flat, which extends itself circularly on all sides when a person changes place upon this surface, he loses sight of certain countries, he discovers others yet he always believes himself at the centre of the extent presented to him As to the sky it appears to us like a canopy stretched over our heads, and concave above to it the sun, moon, and stars, appear attached

The sky exhibiting no difference between its various parts, our eyes do not enable us to ascertain whether it be in motion or at rest But this is not the case with regard to either the sun, the moon, or the stars these luminaries take successively various places, and their motions are visible in all parts of the earth In the morning the sun is seen to rise above the distant mountains, or to spring, as with a sort of effort, from the extremities of the ocean This phenomenon is named the rising of the sun The luminary then runs over the vault of the sky, and at evening sets in the opposite part All the stars follow a similar course they rise successively one after another, in a determinate order,—they pass over the sky, and then set, each in its order, and occupying its own rank and position Put the sun surpasses all the others with regard to splendour this luminary alone directs the repose and the labour of man, his presence causes day, its absence night The side of the heavens where the stars rise is named the east, the opposite side where they set is called the west The points of the sea or of the earth to which the view is limited, constitute the horizon, being the place where the stars seem actually to rise and set

The sun and moon appear to us greater than the other heavenly bodies from this we do not immediately appreciate their real magnitude, but the apparent breadth of their disc, or, according to the received expression, their apparent diameter. To have a correct idea of this sensation,

it must be recollected that objects become visible by means of the luminous rays they transmit to us When we observe a celestial body, the rays proceeding from the opposite sides of its disc intersect in our eye under a certain angle the arc which measures this angle determines the apparent magnitude of the object, or, at least, its apparent diameter

The permanent stars not offering such a regular disc as to enable the eye to appreciate their contour, they appear only as brilliant points in the sky They, however, retain constantly the same mutual arrangement and the same order, they rise and set constantly at the same points of the horizon, without being liable to any perceptible variations except after very extensive intervals of time Ten others only besides the sun and the moon, make exceptions to this rule in truth they rise and set as the stars do, but on carefully remarking their position, it will be perceived at the end of some days that they have changed their places they no longer accompany the same star, no longer rise and set at the same points of the horizon Hence they are called planets, that is to say wandering stars, from the Greek *πλανηταις*, wanderers the others have received, by way of contrast, the name of fixed stars

Besides the planets and fixed stars, there are seen from time to time in the heavens other stars which at first appear very small, slightly luminous and move among the stars very slowly after a little time their brilliancy is increased and their velocity augmented more and more again after a certain time they gradually diminish in a similar manner, and at length are totally lost from the sight These stars are ordinarily followed by a sort of tail, which accompanies them during a part of their appearance sometimes they are surrounded as if by hair, (coma), whence they have obtained the name of comets, that is to say, hairy stars

The planets and comets are not merely distinguished from the other stars by their motions, but they differ also with respect to their tint and their light, which is in general stronger, more brilliant, and less subject to that kind of tremulous impression which is named twinkling or scintillation The luminousness of the planets varies in a way that is very marked, and according to regular periods In fact, some new stars which have appeared at different times among the fixed ones, have shone with a lustre more vivid than that of the planets at the commencement of their appearance, but this great brilliancy has been soon followed by a considerable diminution of lustre, and sometimes by a total disappearance

With regard to the fixed stars, they must necessarily shine by their own light, for if we grant that they consist of gravitating matter, it must be allowed that no star could be near enough to another to be seen by reflected light without a very sensible change of the places of both in consequence of their mutual gravitation, nor would it be possible, on account of the immense distance from us, to distinguish two such bodies from each other

The light of the stars appears to the naked eye to be generally white, being too faint to excite the idea of a particular colour but when it is concentrated by Dr Herschel's large speculums, it becomes in various stars of various hues, and indeed to the naked eye some of the stars appear a little redder, and others a little bluer As to the scintillation or twinkling of the stars, its

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cause is not fully ascertained, but it is referred with some probability, as Dr T Young remarks (Lectures, vol 1 pa 490), to changes which are perpetually taking place in the atmosphere, and which affect its refractive density It is said, that in some climates, where the air is remarkably serene, the stars have scarcely any appearance of twinkling

Above two thousand stars are visible to the naked eye, and when a telescope is employed, their number appears to increase without any other limit than the imperfection of the instrument Dr Herschel has observed in the milky way above ten thousand stars in the space of a square degree Lucretius and Dr Halley have argued, that their number must be absolutely infinite, in order that all of them may remain at rest by the opposition of attractions acting in every possible direction, but we are by no means certain that they do remain in perfect equilibrium

The stars, on account of their apparently various magnitudes, have been distributed into several classes or orders Those which appear largest are called stars of the first magnitude, the next to them in lustre, stars of the second magnitude, and so on to the sixth, which are the smallest that are visible to the bare eye This distribution having been made long before the invention of telescopes, the stars which cannot be seen without the assistance of these instruments are distinguished by the name of telescopic stars

The ancients divided the starry sphere into particular constellations, or systems of stars, according as they lay near one another so as to occupy those spaces which the figures of different sorts of animals or things would take up if they were there delineated And those stars which could not be brought into any particular constellation were called unformed stars

This division of the stars into different constellations, or asterisms, serves to distinguish them from one another, so that any particular star may be readily found in the heavens by means of a celestial globe, on which the constellations are so delineated, as to put the most remarkable stars into such parts of the figures as are most easily distinguished The number of the ancient constellations is 48, and upon our present globes about 70 On the best globes are inserted Bayer's letters, the first in the Greek alphabet being put to the biggest star in each constellation, the second to the next, and so on, by which means every star is as easily found as if a name were given to it Thus, if the star  $\gamma$  in the constellation of the ram be mentioned, every astronomer knows as well what star is meant as if it were pointed out to him in the heavens.

There is also a division of the heavens into three parts 1 The zodiac ( $\zodiacus$ ), from  $\zetaωδιον$ , *zodion*, an animal because most of the constellations in it which are 12 in number, have the names of animals as Aries the ram, Taurus the bull (emim the twins, Cancer the crab, Libra the balance Scorpio the scorpion, Sagittarius the archer, Capricornus the goat, Aquarius the water-bearer, and Pisces the fishes The zodiac goes quite round the heavens it is about 16 degrees broad, so that it takes in the orbits of all the old planets, and likewise the orbit of the moon Along the middle of this zone or belt is the ecliptic, or circle which the earth describes annually as seen from the sun and which the sun appears to describe as seen from the earth 2 All that region of the heavens which is on the north side of the zodiac containing 21 constellations And, 3 That on the south side, containing 15

The names of the constellations, and the number of stars observed in each of them by different astronomers, are as follow

<i>The Ancient Constellations</i>				<i>Ptolemy</i>	<i>Tycho</i>	<i>Hevelius</i>	<i>Flamsteed</i>	
Ursa minor	-	-	The Little Bear	-	8	7	12	24
Ursa major	-	-	The Great Bear	-	35	29	73	87
Dracon	-	-	The Dragon	-	31	32	40	80
Cepheus	-	-	Cepheus	-	13	4	51	35
Bootes, <i>Arctophilax</i>	-	-	Bootes	-	23	18	32	54
Corona Borealis	-	-	The Northern Crown	-	8	8	8	21
Hercules, <i>Engonasin</i>	-	-	Hercules kneeling	-	29	28	45	113
Lyra	-	-	The Harp	-	10	11	17	21
Cygnus, <i>Gallina</i>	-	-	The Swan	-	19	18	47	81
Cassiopeia	-	-	The Lady in her Chair	-	13	26	37	55
Perseus	-	-	Perseus	-	29	29	46	59
Auriga	-	-	The Waggoner	-	14	9	40	66
Serpentarius, <i>Ophiuchus</i>	-	-	Serpentarius	-	23	15	40	74
Serpens	-	-	The Serpent	-	18	13	22	64
Sagitta	-	-	The Arrow	-	5	5	5	18
Aquila, <i>Fultur</i>	-	-	The Eagle	}	15	{ 12	23	{ 71
Antinous	-	-	Antinous					
Delphinus	-	-	The Dolphin	-	10	10	14	18
Equulus, <i>Equus sectio</i>	-	-	The Horse's Head	-	4	4	6	10
Pegasus, <i>Equus</i>	-	-	The Flying Horse	-	20	19	38	89
Andromeda	-	-	Andromeda	-	23	23	47	66
Triangulum	-	-	The Triangle	-	4	4	12	16
Aries	-	-	The Ram	-	18	21	27	66
Taurus	-	-	The Bull	-	44	43	51	141
Gemini	-	-	The Twins	-	25	25	38	85
Cancer	-	-	The Crab	-	23	15	29	83
Leo	-	-	The Lion	}	35	{ 30	49	95
Coma Berenices	-	-	Berenice's Hair					
Virgo	-	-	The Virgin	-	32	33	50	110
Libra, <i>Chela</i>	-	-	The Scales	-	17	10	20	51

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<i>The Ancient Constellations</i>				<i>Ptolemy</i>	<i>Tycho</i>	<i>Hewlious</i>	<i>Flamsteed</i>	
Scorpio	-	-	The Scorpion	-	24	10	20	44
Sagittarius	-	-	The Archer	-	31	14	22	63
Capricornus	-	-	The Goat	-	28	28	29	51
Aquarius	-	-	The Water-bearer	-	45	41	47	108
Pisces	-	-	The Fishes	-	38	36	39	113
Cetus	-	-	The Whale	-	22	21	45	57
Orion	-	-	Orion	-	38	42	62	78
Eridanus, <i>Fluvius</i>	-	-	Eridanus, the River	-	34	10	27	84
Lepus	-	-	The Hare	-	12	13	16	19
Canis major	-	-	The Great Dog	-	29	13	21	31
Canis minor	-	-	The Little Dog	-	2	2	13	14
Argo Navis	-	-	The Ship	-	45	3	4	64
Hydra	-	-	The Hydra	-	27	19	31	60
Crater	-	-	The Cup	-	7	3	10	31
Corvus	-	-	The Crow	-	7	4	0	9
Centaurus	-	-	The Centaur	-	37	0	0	35
Lupus	-	-	The Wolf	-	19	0	0	24
Ara	-	-	The Altar	-	7	0	0	9
Corona Australis	-	-	The Southern Crown	-	13	0	0	12
Piscis Australis	-	-	The Southern Fish	-	18	0	0	24

## *The New Southern Constellations*

Columba Noachi	-	Noah's Dove	-	-	-	-	10
Robur Carolinum	-	The Royal Oak	-	-	-	-	12
Grus	-	The Crane	-	-	-	-	13
Phoenix	-	The Phoenix	-	-	-	-	13
Indus	-	The Indian	-	-	-	-	12
Pavo	-	The Peacock	-	-	-	-	14
Apus, <i>Avus Indica</i>	-	The Bird of Paradise	-	-	-	-	11
Apus <i>Musca</i>	-	The Bee or Fly	-	-	-	-	4
Chamaelon	-	The Camelion	-	-	-	-	10
Triangulum Australe	-	The South Triangle	-	-	-	-	5
Piscis volans, <i>Passer</i>	-	The Flying Fish	-	-	-	-	8
Dorado, <i>Xiphius</i>	-	The Sword Fish	-	-	-	-	6
Toucan	-	The American Goose	-	-	-	-	9
Hydrus	-	The Water Snake	-	-	-	-	10

## *Hewlious's Constellations made out of the unformed Stars*

Hewlious's Constellations made out of the unformed Stars						Hewlious	Flamsteed
Lynx	-	-	The Lynx	-	-	19	44
Leo minor	-	-	The Little Lion	-	-	-	53
Asterion & Ghara	-	-	The Greyhound	-	-	23	25
Cerberus	-	-	Cerberus	-	-	-	4
Vulpecula & Anscr	-	-	The Fox and Coose	-	-	27	35
Scutum Sobieski	-	-	Sobieski's Shield	-	-	-	7
Lacerta	-	-	The Lizard	-	-	10	16
Camelopardalus	-	-	The Camelopard	-	-	32	58
Monoceros	-	-	The Unicorn	-	-	19	31
Sextans	-	-	The Sextant	-	-	11	41

Besides the names of the constellations, the ancient Greeks gave particular names to some single stars, or small collections of stars: thus, the cluster of small stars in the neck of the bull was called *pleiades*; five stars in the bull's face, the *hyades*; a bright star in the breast of Leo, the lion's heart, and a large star between the knees of Bootes, *Arcturus*.

The constellations may be represented on two planispheres projected on a great circle or on the convex surface of a solid sphere, as on the celestial globe, or most perfectly on the concave surface of a hollow sphere. If the celestial globe is made use of, after rectifying it to the time of the night, the stars may be found, by conceiving a line drawn from the centre of the globe through any star in the heavens, and its representation upon the globe.

The stars are, in general, dispersed without any regular order, but we may observe in many parts of the heavens that a number of them are so much nearer together than to the rest, as to form a cluster or nebula. The ancients had noticed some of the most conspicuous nebulae but Herschel first directed the attention of modern

astronomers to the large one situated in the constellation Orion. Herschel has now given us catalogues of 2500 nebulae many of which can be resolved into separate stars by very high magnifying powers, but others appear to consist of a luminous matter, spread uniformly in the neighbourhood of the several stars to which they seem to belong.

It has been conjectured that all stars are disposed in nebulae, and that those which appear to us to be more widely separated are individual stars of that particular nebula in which we are placed, and of which the marginal parts may be observed in the form of a lucid zone, which is called the milky way, being too distant to allow its single constituent stars to be perceived by the naked eye. This opinion, Dr T. Young informs us, was first suggested by professor Kant the author of the system of metaphysics called the Critical Philosophy. The idea was adopted by Lambert, who considers the largest stars as constituting a distinct nebula placed among a multitude of others which together produce the appearance of a continued zone, and Dr. Herschel has investigated very particularly the figure of a



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single nebula, which would be capable of being projected into the form of the milky way. We must not, however, suppose that each of Herschel's 2500 nebulae can be at all comparable in magnitude to this supposed nebula, since many of them are almost as much resolved by the telescope into single stars as the milky way itself, which would be utterly impossible if the stars which they contain were equally numerous with those of the nebula to which the milky way belongs. Supposing all the stars of this nebula to be as remote from each other as the nearest of them are from the sun, it may be calculated that the most distant are about 500 times as far from us as the nearest, and that light, which is probably 15 or 20 years in travelling to us from Sirius, would be nearly 20000 in passing through the whole diameter of the milky way. A nebula of the same size as this, appearing like a diffused light of a degree in diameter must be at such a distance that its light would require a million years to reach us.

Properly speaking, the stars are not absolutely fixed with respect to each other, for several of them have particular motions which have been discovered by a comparison of accurate observations, made at very distant times. Arcturus, for instance, has a progressive motion, amounting to more than 2 seconds annually. Dr Maskelyne found that, out of 36 stars whose places he ascertained with great precision, 35 had a proper motion. Mr. Mitchell and Dr. Herschel have conjectured that some of the stars revolve about others which are apparently situated very near them, and perhaps even all the stars may in reality change their places more or less, although their relative situations, and the directions of their paths, may often render their motions imperceptible to us.

Inspecting all these arrangements of stars into different systems, Dr. Herschel has lately entered into a very extensive field of observation and speculation, and has divided them into a number of classes, to each of which he has assigned a distinct character. Some, he supposes, like our sun, to be insulated stars, beyond the reach of any sensible action of the gravitation of others, and around these alone he conceives that planets and comets revolve. Double stars in general, he imagines to be much nearer to each other, so as to be mutually affected by their mutual gravitation, and only to preserve their distance by means of the centrifugal force derived from a revolution about their common centre of gravity, an opinion which he thinks, is strongly supported by his own observations of some of the nearest of the positions of double stars. Others again he supposes to be united in triple, quadruple, and still more compound systems. A fourth class consists of nebulae like the milky way, the clusters of stars being, indeed, and appearing brightest in the middle. Groups of stars Dr. Herschel distinguishes from these by a want of apparent condensation about a centre of attraction, and clusters by a still greater central compression. A fifth class includes such nebulae as have not yet been resolved into stars, some of which Dr. Herschel supposes to be so remote that the light emitted by them must actually have been two millions of years in travelling to our system. The nebula of another description resemble stars surrounded by a burr, or faint disc of light, a diffused milky nebulousity, apparently produced by some cause co-existent with the immediate light

of any stars, is the next in order: and Dr. Herschel has distinguished other more contracted nebulous appearances, in different states of condensation, into the classes of nebulous stars, and planetary nebulae, with and without bright central points.

Farther, it is fully ascertained that some of the stars have periodical changes of brightness which are supposed to arise either from the temporary interposition of opaque bodies revolving about them, or, still more probably from a rotatory motion of their own which brings at certain periodical times a less luminous part of the surface into our view. Thus, the star Algol, which is usually of the second magnitude becomes at intervals of two days and twenty one hours each, of the fourth magnitude only, and occupies even hours in the gradual diminution and recovery of its light. Other irregular variations may possibly be occasioned by the appearance and disappearance of spots occurring like the spots of the sun, without any determinate order, or assignable cause, and many stars have, in the course of ages wholly disappeared, and sometimes have been again recovered others have made their appearance for a short time, where no star had before been seen. Such a temporary star was observed by Hipparchus 120 years before the Christian era, and the circumstance suggested to him the propriety of making an accurate catalogue of all the stars, with their respective situations, which is still extant, having been preserved by Ptolemy, who added 4 stars to the 1022 that it contained. In 1572, Cornelius Gemma discovered a new star in Cassiopeia, which was so bright as to be seen in the daytime, and gradually disappeared in sixteen months. Kepler, in 1604 observed a new star in Serpentarius, more brilliant than any other star or planet, and changing perpetually into all the colours of the rainbow, except when it was near the horizon it continued visible for about a year. Many other new stars have since been observed at different times. — Young's Lectures, vol. I. p. 495.

## On the Solar System

The most conspicuous of all the celestial bodies which we have been examining is *the Sun*, that magnificent luminary which occupies the centre of the system that comprehends our earth, together with a variety of other primary and secondary planets, and a still greater number of comets.

The sun is a body nearly spherical, whose diameter is about 853,250 English miles, situated at the centre of the system of the planets it exerts upon all of them a remarkable influence it heats them, it enlightens them, and enchains them in their elliptical orbits in virtue of a force varying inversely as the squares of the distances, and directly as the mass.

The sun agrees with the fixed stars in the property of emitting light continually, and in retaining constantly its relative situation with very little variation. It is probable also that these bodies have many other properties in common. The sun is, therefore, considered as a fixed star comparatively near us, and the stars as suns at immense distances from us, and we infer from the same analogy that the stars are possessed of gravitation, and of the other general properties of matter, they are supposed to emit heat as well as light, and it has with reason been conjectured

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that they serve to cherish the inhabitants of a multitude of planetary bodies revolving about them

The sun, like many other stars, has probably a progressive motion, which, from a comparison of the apparent motions of a great number of the stars, is supposed to be directed towards the constellation Hercules. It is beyond all question that many of the stars have motions peculiar to themselves, and it is not certain that any of them are without such motions. It is, therefore, in itself highly probable that the sun may have such a motion. And Dr Herschel has confirmed this conjecture by arguments almost demonstrative.

Besides this progressive motion the sun is subjected to some small change of place, dependent on the situations of the planetary bodies, which was long inferred from theory only but which has been actually demonstrated by modern observations. Supposing all the planets to be in conjunction, or nearly in the same direction from the sun, the common centre of inertia of the system is at the distance of about a diameter of the sun from his centre. And since the centre of inertia of the whole system must be undisturbed by any reciprocal actions of the bodies composing it, the sun must describe an irregular orbit round this centre, his greater distance from it being equal to his own diameter. We may form an idea of the magnitude of this orbit by a comparison with the orbit of the moon. A body revolving about the sun, in contact with his surface, must be nearly twice as remote from his centre as the moon is from the earth, and the sun's revolution about the common centre of gravity of the system must therefore be, where it is most remote, at four times the distance of the moon from the earth.

The sun revolves on his axis in twenty-five days ten hours with respect to the fixed stars, this axis is directed towards a point about half way between the pole star and Lyra, the plane of the rotation being inclined a little more than seven degrees to that in which the earth revolves. The direction of this motion is from west to east, terms which we can only define from our pre-supposed knowledge of the stars, by saying that the motion is such, that a point of the sun's surface at first opposite Aries, moves towards Taurus. All the rotations of the different bodies which compose the solar system, as far as they have been ascertained, are in the same direction.

The time and direction of the sun's rotation is ascertained by the change in the situation of the spots, which are usually visible on his disc, and which some astronomers suppose to be elevations, but others, apparently with better reason, to be excavations or deficiencies in the luminous matter covering the sun's surface. These spots are frequently observed to appear and disappear, and they are in the mean time liable to great variations, but they are generally found about the same points of the sun's surface. Lalande imagined that they were parts of the solid body of the sun, which by some agitations of the luminous ocean, with which he conceived the sun to be surrounded, are left netherly or entirely bare. Dr Wilson and Dr. Herschel are disposed to consider the spots as consisting rather of a flame than of a liquid substance, and Dr Herschel attributes the spots to the emission of an aeriform fluid, not yet in combustion, which displaces the

general luminous atmosphere, and which is afterwards to serve as fuel for supporting the process; hence he supposes the appearance of copious spots to be indicative of the approach of warm seasons on the surface of the earth, and he has attempted to main in this opinion by historical evidence. The exterior luminous atmosphere has an appearance somewhat mottled some parts of it, appearing brighter than others have generally been called *faculae* but Dr Herschel distinguishes them by the name of ridges and nodules. The spots are usually surrounded by margins less dark than themselves which Dr Herschel calls shallows and which he considers as parts of an inferior stratum consisting of opaque clouds, capable of protecting the immediate surface of the sun from the excessive heat produced by combustion in the superior stratum, and perhaps of rendering it habitable to animated beings. Young, vol 1. p. 501.

The planetary system comprises at least thirty bodies, without including comets. Among these thirty bodies the sun is the only one which is really phosphoric, or that shines with a lustre which is, properly speaking, its own. All the others are opaque, that is to say, they intercept the luminous fluid, and are only rendered visible by means of reflected light. Eleven of these bear the name of planets, the other eighteen are known under that of *secondary planets* or *satellites*.

The planets perform their revolutions about the sun, in elliptical curves differing but little from circles and of which the centre of the sun (or rather the common centre of inertia of the whole system) occupies one of the foci. Commencing with that which is nearest the sun, they have the following disposition *Mercury, Venus, the Earth, Mars, Ceres, Pallas, Juno, Vesta, Jupiter, Saturn, Uranus, or Herschel*. See Pl. 10.

Each of the planetary orbits is in a plane which passes through the centre of the sun.

The plane of the earth's orbit is named the plane of the ecliptic. We conceive it prolonged on all sides, and astronomers observe the situations of the planes of the other orbits by referring them to this.

All the planets move in their orbits from west to east. The velocities with which they move are not invariable, but the areas described by their radii vectores are always proportional to the times. The motion of the planets is likewise so much the more rapid as they are more remote from the sun, such inanner that the magnitude of the orbit and the slowness of the motion concur in augmenting the durations of their sidereal revolutions.

Mercury and Venus are nearer the sun than the earth is, on which account they are called *inferior* or *interior* planets. Those which are farther from the sun than the earth are, on the contrary, called *superior* or *exterior* planets.

The *inferior* planets can never be in opposition to the sun (See *OPPOSITION*), but they will be found twice in conjunction with that luminary during the course of their sidereal revolution: first, when they are found between the sun and the earth; secondly, when the sun is between the earth and the planets. See *CONJUNCTION*.

The *inferior* planets present different phases, when they are contemplated through the medium of telescopes. These appearances are more perceptible for Venus than for Mercury, and depend upon the proper motion of those planets. If this motion be combined with that of the earth in its

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orbit which is affected more slowly by reason of its greater distance from the sun, new appearances will be found to arise, such as the direct motion of those planets in the inferior conjunction, and their retrograde motion in the superior conjunction. See *Apparent Station, Station, Retrostation, &c*

The orbits of the superior planets include that of the earth, at the same time that the velocity of the earth is greater than that of the superior planets; hence it results that the earth in its motion passes between these planets and the sun, which causes them to appear in opposition to that luminary. In the opposition they have a motion apparently retrograde, it is direct in the conjunction, as that of Venus and Mercury is in their superior conjunctions.

Some of the planets, as the Earth, Jupiter, Saturn and Uranus have moons or satellites, which turn about them in like manner as they revolve about the sun. Thus the earth has one moon or satellite; Jupiter four, Saturn seven, and Uranus six. See MOON and SATELLITES.

With respect to these satellites or secondary planets, the following remarkable circumstance takes place. The moon has four satellites of Jupiter, and one of Saturn, are found by observation to turn about an axis in the same time as they respectively revolve about their primaries. And although it has not yet been ascertained from observations whether the same be true for the other satellites of Saturn and of Uranus, yet from the uniformity which obviously pervades the system, we conclude that the same is true for all the secondaries.

The planet Saturn is encompassed with a thin flat ring, or, as it is now found, with two rings, lying one within the other edgewise toward the planet, and detached from it. Their planes pass through the centre of Saturn. If a circular annulus be cut out of a card, and divided into two parts by a concentric circle, leaving the inner breadth about three times that of the outer, and a ball be then put within of such a size that the space between the ball and the annulus may be a little larger than the breadth of the annulus, a representation will thus be obtained of Saturn and his two rings. That side next the sun is bright like the body of the planet. The rings revolve in their own plane, and not being of a regular figure, their centre of inertia is at a small distance from the centre of Saturn. M. Laplace computed the time of the revolution to be 10h 39m 36s, agreeing very nearly with the time found by Dr Herschel's observation.

If the mean distances either of the planets or of their satellites be compared with the duration of their sidereal revolutions, it will be easy to trace the beautiful relation discovered by Kepler, namely, that while several bodies turn about the same point, the squares of the periodical times are respectively as the cubes of their mean distances from that point; and, by combining this law with the theorem of Huygens, namely, that when the squares of the periodical times of several bodies circulating about the same point, are respectively as the cubes of the distances from that point, the central forces which animate them are in the inverse ratio of the squares of the same distances, it will be easy to discover the law of gravitation, and, as it were, to unveil the mechanism of the planetary system.

We shall now present the reader with some tables exhibiting a brief view of the solar system.

## Duration of the sidereal revolutions of the planets, or of their periodic times

Mercury	-	-	-	87 969255 days
Venus	-	-	-	224 700817
The Earth	-	-	-	365 256384
Mars	-	-	-	686 979579
Ceres	-	-	-	1690 000000
Pallas	-	-	-	1681 000000
Juno	-	-	-	2007 500600
Vesta	-	-	-	
Jupiter	-	-	-	4332 602208
Saturn	-	-	-	10759 077215
Uranus	-	-	-	30689 000000

II Semiaxes major of the planetary orbits, or their mean distances from the sun, that of the earth, which is 93 millions of English miles, being represented by

Mercury	-	-	-	0 387100
Venus	-	-	-	0 723332
The Earth	-	-	-	1 000000
Mars	-	-	-	1 523693
Ceres	-	-	-	2 776755
Pallas	-	-	-	2 776909
Juno	-	-	-	2 876731
Jupiter	-	-	-	5 202778
Saturn	-	-	-	9 538785
Uranus	-	-	-	19 183475

## III Relations of excentricity to the semiaxes major (unity)

Mercury	-	(for 1750)	-	0 205513
Venus	-	Do	-	0 006385
Earth	-	Do	-	0 016814
Mars	-	Do	-	0 093082
Ceres	-	(for 1805)	-	0 790000
Pallas	-	Do	-	0 246300
Juno	-	Do	-	0 200000
Jupiter	-	(for 1750)	-	0 048077
Saturn	-	Do	-	0 056223
Uranus	-	Do	-	0 046683

## IV Inclination of orbits to the ecliptic

Mercury	-	(A D 1750)	-	7 0000
Venus	-	Do	-	3 5930
The Earth	-	Do	-	0 0000
Mars	-	Do	-	1 8501
Ceres	-	(A D 1805)	-	10 6167
Pallas	-	Do	-	33 7500
Juno	-	Do	-	21 0000
Jupiter	-	(A D 1750)	-	1 3174
Saturn	-	Do	-	2 4986
Uranus	-	Do	-	0 7706

## V Diameters of the planet, the diameter of the earth (7950 English miles) being assumed as unity.

Mercury	-	$\frac{7}{17}$	-	Venus	-	$\frac{31}{34}$
The Earth	-	1	-	Mars	-	$\frac{54}{54}$
Ceres	-	$\frac{109}{488}$	-	Pallas	-	$\frac{109}{379}$
Juno	-	$\frac{109}{556}$	-	Jupiter	-	$\frac{112}{112}$
Saturn	-	$\frac{109}{1018}$	-	His Ring	-	$\frac{231}{231}$
Uranus	-	$\frac{109}{200}$	-	The Moon	-	$\frac{27}{27}$
The Sun	-	112	-		-	

## VI Rotations of the planets

	d	h	m
Mercury	-	-	unknown
Venus	-	-	0 23 20
The Earth	-	-	0 23 56 $\frac{1}{4}$
The Moon	-	-	27 7 43 $\frac{1}{2}$
Mars	-	-	0 24 40
Jupiter	-	-	0 9 56
Saturn	-	-	0 10 17
Uranus	-	-	unknown

# ASTRONOMY

The actual masses of the planets have been investigated upon principles which may be here stated in a narrow compass. The forces which solicit two bodies moving circularly are in a ratio composed of the masses, the distances from the centre, and the inverse square of the periodic times (see CENTRAL FORCES) whence it results that the gravity of one of the satellites towards its planet, is to that of the earth towards the sun, as the mean distance of the satellite from the centre of its planet, divided by the square of its periodic time, is to the mean distance of the earth from the sun, divided by the square of its periodic time or, expressing these gravitating tendencies by  $G, g$  the mean distances by  $R, r$  the periodic times by

$T, t$  we have  $G \propto \frac{R}{T^2} \frac{r}{t^2}$ . But, denoting by  $M$  the mass of the sun, and by  $m$  that of the planet about which the satellite revolves, we have by the nature of gravitation  $G \propto \frac{M}{R^2} \frac{m}{r^2}$

therefore,  $\frac{R}{T^2} \frac{r}{t^2} \propto \frac{M}{R^2} \frac{m}{r^2}$ , and, consequently,

$$\frac{R^3}{T^2} \propto \frac{M}{t^2} \quad M \propto m$$

By applying this result to the planets which have satellites it is easy to find the value of their masses, for, we know the radii of the orbits of the satellites, as well as the length of their sidereal revolutions, or their periodic times. Taking the cubes of the radii of these orbits, and dividing them successively by the squares of the periodic times, the quotients will give the values of the masses of the bodies about which the satellites circulate.

As to the planets which have not satellites Laplace has deduced the values of the masses of Venus and Mars, from the secular diminution of the obliquity of the ecliptic, and the acceleration of the moon's mean motion. The mass of Mercury was inferred from its volume, supposing the densities of that planet and the earth reciprocally as their mean distances from the sun. *Mécanique Céleste*, tome iii. p. 64, *Exposition du système du Monde*, ed. 2. p. 19.

Thus was deduced the following table

VII *Masses of the planets, that of the sun being taken for unity*

Mercury - - - -  $\frac{1}{1625}$

Venus

The Earth

Mars

Uranus

The Moon  $\frac{1}{685} \times \frac{1}{329020}$

The densities of bodies are in the direct ratio of their masses, and the inverse ratio of the volumes, and when bodies are nearly spherical, the volumes are as the cubes of their radii, whence it results that the densities are then as the masses divided by the cubes of the radii. By

this process we find the following numbers for the mean densities of the planets, that of the sun being assumed as unity

## VIII *Densities of the Planets*

Mercury	-	-	-	-	101743
Venus	-	-	-	-	50446
The Earth	-	-	-	-	39393
Mars	-	-	-	-	26734
Jupiter	-	-	-	-	08601
Saturn	-	-	-	-	04951
Uranus	-	-	-	-	01376
The Moon	-	-	-	-	24656

For Dr Hutton's results on this subject, the reader may consult O Gregory's *Astronomy*, p. 247.

Besides the bodies which revolve completely round the sun, within the limits of our observation, there are others, of which we only conclude from analogy that they perform such revolutions. These are the comets they generally appear attended by a nebulous light, either surrounding them as a coma, or stretched out to a considerable length as a tail, and they sometimes seem to consist of such light only. Their orbits are so eccentric, that in their remoter situations the comets are no longer visible to us, although at other times they approach much nearer to the sun than any of the planets for the comet of 1680, when at its perihelion was at the distance of only one sixth of the sun's diameter from his surface. Their tails are often of great extent, appearing as a faint light, directed always towards a point nearly opposite to the sun. It is quite uncertain of what substance they consist, and it is difficult to determine which of the conjectures respecting them is the least improbable. See COMET.

Nearly 500 comets are recorded to have been seen at different times and the orbits of about 100 have been ascertained with tolerable correctness but we have no opportunity of observing a sufficient portion of the orbit of any comet, to determine with accuracy the whole of its form as an ellipsis, since the part which is within the limits of our observation does not sensibly differ from the parabola.

The last comet which has been observed was seen in the autumn of 1807. It was distinctly seen by the naked eye for about six weeks in September and October, and the elements, as far as they had been determined when this treatise was sent to press, were as below

Longitude of the ascending node	8	27	15
Inclination of the orbit	-	-	65 27
Longitude of the perihelion	-	-	8 27 45
Perihelion distance in English miles	60713000		
Arrival at perihelion	Sept 17d	0h	3m

Two comets at least, or perhaps three, have been recognised in their return. A comet appeared in 1770 which Prosperin suspected to move in an orbit materially different from a parabola. Mr Lexell determined its period to be five years and seven months, and its extreme distances to be between the orbits of Jupiter and of Mercury but it does not appear that any subsequent observations have confirmed his theory.

Dr Halley foretold the return of a comet about 1758, which had appeared in 1531, in 1507, and in 1682 at intervals of about seventy-five years, and with Clairaut's farther correction for the perturbations of Jupiter and Saturn, the time agreed within about a month. The mean distance of this comet from the sun must be less than that of

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Uranus or Herschel Dr Halley also supposed the comet of 1680 to have been seen in 1106, in 531, and in the year 44 before Christ, having a period of 575 years, and it has been conjectured that the comets of 1556 and 1241 were the same, the interval being 292 years, a conjecture which will either be confirmed or counted in the year 1819. T Young's Lectures, l. 113.

Some useful information on the subject of comets is given in Ch. 21 of O Gregory's *Astronomy*, and several very striking conjectures in Lambert's *Letters on Cosmogony*. But after all, it must be acknowledged that the philosophy of comets is, at present, very imperfect. The prediction of Seneca remains yet to be accomplished, wherein he says "The time will come when the nature of comets and their magnitudes will be demonstrated, and the routes they take, so different from the planets explained. Posterity will then wonder, that the preceding ages should be ignorant of matters so plain and easy to be known."

## *On the Laws of Gravitation*

It now remains that we endeavour to explain to the reader, the nature and operation of that extensive and general principle from which the analogies that obtain in the motion of the heavenly bodies naturally flow, that invisible chain which binds together so many bodies in an indissoluble connection, and yet does not oblige them to come into immediate contact. This explanation we shall give nearly in the words of Dr T Young, as below.

It was first systematically demonstrated by Sir Isaac Newton, that all the motions of the heavenly bodies, which have been described, may be deduced from the same force of gravitation which causes a heavy body to fall to the earth. He has shewn that, in consequence of this universal property of matter, all bodies attract each other with forces decreasing as the squares of the distances increase, and of later years the same theory has been still more accurately applied to the most complicated phenomena. We are at present to take a general view of the operation of this law, in the same order in which the affections of the celestial bodies have been enumerated.

The bodies which exist in nature are never single gravitating points: so that, in order to determine the effects of their attraction we must suppose the actions of an infinite number of such points to be combined. It was shewn by Newton that all the matter of a spherical body or of a spherical surface, may be considered, in estimating its attracting force on other matter, as collected in the centre of the sphere. The steps of the demonstration are the following: a particle of matter, placed at the summit of a given cone or pyramid, is attracted by a thin surface, composed also of attracting matter, occupying the base of the cone, with equal force, whatever may be the length of the cone, provided that its angular position remain unaltered: hence it is easily inferred that if a gravitating point be placed anywhere within a hollow sphere, it will remain in equilibrium, in consequence of the opposite and equal action of the infinite number of minute surfaces, terminating the opposite pyramids into which the sphere may be divided: it is also demonstrable by the assistance of a fluxional calculation, that a point placed within the surface is attracted by it, precisely in the same manner as if the whole matter which it contains were

collected in the centre, consequently the same is true of a solid sphere, which may be supposed to consist of an infinite number of such hollow spheres. If, however, the point were placed within a hollow sphere, it would be urged towards the centre, by a force which is simply proportional to its distance from that centre. This proposition tends very much to facilitate all calculations of the attractions of the celestial bodies, since all of them are so nearly spherical, that their action on any distant bodies is the same as if the whole of the matter of which they consist were condensed into their respective centres, but, if the force of gravity varied according to any other law than that which is found to prevail, this simplification would no longer be admissible, even with respect to a sphere.

It can scarcely be doubted that the power of gravitation extends from one fixed star to another, although its effects may in this case be far too inconsiderable to be perceived by us. It may possibly influence the progressive motions of some of the stars, and if, as Dr Herschel supposes, there are double and triple stars revolving about a common centre, they must be retained in their orbits by the force of gravity. Dr Herschel also imagines that the motion of our sun is in some measure derived from the same cause, being directed nearly towards a point in which two strata of the milky way meet, the attraction of the stars, other things being equal, must, however, be proportional to their brightness, and that part of the heavens to which the sun is probably moving appears to afford less light than almost any other part, nor does the hemisphere of which it is the centre abound so much in bright stars as the opposite hemisphere. If Sirius were a million times as far from the sun as the earth, and if he should descend towards the sun by means of their mutual gravitation only, he would move, on a rough estimate, but about forty feet in the first year, and in 1000 years only 8000 miles.

The sun's change of place dependent on the relative situation of the planets is so inconsiderable, that it escaped observation until its existence had been deduced from theory. Not but that this change would be sufficiently conspicuous if we had any means of detecting it, since it may amount in the whole to a distance equal to twice the sun's diameter or seven times the distance of the moon from the earth, and this change is generally deducible from the general and unquestionable law of mechanics, that the place of the centre of inertia of a system cannot be changed by any reciprocal or mutual action of the bodies composing it, the action of gravity being found to be perfectly reciprocal. But the earth accompanies the sun in great measure in this aberration, and the other planets are also more or less affected by similar motions, so that the relative situations are much less disturbed than if the sun described this irregular orbit by the operation of a cause foreign to the rest of the system.

The simple revolution of a body in a given plane, indicates at first sight the existence of an attractive force directed to some point within the orbit, and the Keplerian law of the equality of the arcs described in equal times by a line drawn from each planet to the sun agrees precisely with what is demonstrable of the effects of central forces, and points at once to the sun as the centre of attraction of the system. And since the orbits of the planets are elliptical, and the sun is placed in one of the foci of each, it may be mathematically

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cally demonstrated that the force directed to the sun must increase as the square of the distance decreases, and vice versa. See **ATTRACTION**.

The times of the revolution of the planets are also in perfect conformity with the laws of gravitation, that is, the squares of the times are proportional to the cubes of the mean distances from the sun. It was easy to infer, from what Huygens had already demonstrated of centrifugal forces, that this Keplerian law must be true of bodies revolving in circles by the force of gravitation, but Newton first demonstrated the same proportion with respect to elliptic orbits, and shewed that the time of revolution in an ellipse is equal to the time of revolution in a circle, of which the diameter is equal to the major axis of the ellipse, or the semidiameter to the mean distance of the planet.

The universality of the laws of gravitation, as applied to the different planets, shews also that the matter of which they are composed is equally subjected to its power, for if any of the planets contained a portion of an inert substance, requiring a force to put it in motion, and yet not liable to the force of gravitation, the motion of the planet would be materially different from that of any other planet similarly situated.

The deviations of each planet from the plane of its orbit, and the motions of its nodes or the points in which the orbit intersects the plane of the ecliptic, as well as the motions of the aphelion, or the point where the orbit is remotest from the sun, have also been deduced from the attractions of the other planetary bodies, but the calculations of the exact quantities of these perturbations are extremely intricate. In general, each of the disturbing forces causes the nodes to have a slight degree of retrograde motion, but on account of the peculiar situation of the orbits of Jupiter and Saturn, it happens that the retrograde motion of Jupiter's node, on the plane of the orbit of Saturn, produces a direct motion on the ecliptic, so that the action of Saturn tends to lessen the effect of the other planets in causing a retrograde motion of Jupiter's nodes on the ecliptic.

The secular diminution of the obliquity of the ecliptic, or that slow variation of its position, which is only discovered by a comparison of very distant observations, is occasioned by the change of position of the earth's orbit, in consequence of the attractions of the other planets, especially of Jupiter. It has been computed that this change may amount in the course of many ages to  $10''$  or  $11''$ , with respect to the fixed stars; but the obliquity of the ecliptic to the equator can never vary more than two or three degrees, since the equator will follow, in some measure, the motion of the ecliptic.

The mutual attraction of the particles of matter composing the bulk of each planet would naturally dispose them, if they were either wholly or partially fluid, to assume a spherical form, but their rotatory motion would require, for the preservation of this form, an excess of attraction in the equatorial parts, in order to balance the greater centrifugal force arising from the greater velocity of their motion; but since the attractive force of the sphere on the particles at an equal distance from its centre is every where equal, the equatorial parts would necessarily recede from the axis, until the greater number of particles, acting in the same column, compensated for the greater effect of the centrifugal force. The form would thus be changed from a sphere to an oblate or flattened spheroid, and the surface of a fluid

either wholly or partially covering a solid body must assume the same figure, in order that it may remain at rest. The surface of the sea is, therefore, spheroidal, and that of the earth only deviates so far from a spheroidal figure, as it is above or below the general level of the sea.

The action of the sun and moon on the prominent parts about the earth's equator, produces a slight change of the situation of its axis, in the same manner as the attraction of the other planets occasions a deviation from the plane of its orbit. Hence arises the precession of the equinoxes, or the retrograde motion of the equinoctial points, amounting annually to about 50 seconds. The nutation of the earth's orbit is a small periodical change of the same kind, depending on the position of the moon's nodes, in consequence of which, according to Dr Bradley's original observations, the pole of the equator describes in the heavens a little ellipse of which the diameters are 16 and 20 seconds. The same cause is also concerned in modifying the secular variation of the obliquity of the ecliptic, and, on the other hand, this variation has a considerable effect on the apparent precession of the equinoxes. On account of the different quantity of the precession at different times, the actual length of the tropical year is subjected to a slight variation, it is now 4 or 5 seconds shorter than it was in the time of Hipparchus. The utmost change that can happen from this cause amounts to 4 seconds.

The exact computation of the moon's motion is one of the most difficult as well as important problems in astronomy, but it is easy to understand, in general, how the difference in the quantity and direction of the sun's actions on the moon and earth may cause such a derangement of the moon's gravitation towards the earth that the inclination of the orbit must be variable, that the nodes must have a retrograde, and the apses a direct motion, and that the velocity of the moon must often be different from that which she would have, according to the Keplerian law, in a simple elliptic orbit.

For the sun's attraction, as far as it acts equally on the earth and the moon, can have no effect in disturbing their relative position being always employed in modifying their common annual revolution, but the difference of the forces occasioned by the difference of distances always tends to diminish the effect of their mutual attraction, since the sun acts more powerfully on the nearer than on the remoter of the two bodies. The difference of the directions in which the sun acts on the earth and moon, produces also a force which tends in some degree to bring them nearer together, but this force is, on the whole, much smaller than the former, and the result of both these disturbing forces, is always directed to some point in the line which joins the earth and the sun, on the same side of the earth with the moon. It is obvious that when the nodes are also in this line the disturbing force can have no effect either on their position or on the inclination of the orbit, since it acts wholly in the plane of that orbit, but when they are in any other situation the disturbing force must cause a deviation from the plane towards the side on which the sun is situated, so that the inclination of the orbit increases and decreases continually and equally, but whatever may be the position of the nodes, it will appear that they must recede during the greater part of the moon's revolution, and advance during the smaller.

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When the disturbing force tends to separate the earth and moon, it deducts from the gravitation of the moon towards the earth a portion which increases with the distance, and therefore causes the remaining force to decrease more rapidly than the square of the distance increases, and the reverse happens when the disturbing force tends to bring the earth and moon nearer together, but the former effect is considerably greater than the latter. Now, in the simple ellipse when the body descends from the mean distance, the velocity continually prevails over the attractive force, so as to turn away more and more the direction of the orbit from the revolving radius, until at a certain point, namely, the lower apsis, it becomes perpendicular to it but if the central force increases in a greater proportion than is necessary for the description of the ellipse, the point where the velocity prevails over it will be more remote than in the ellipse, and this is expressed by saying that the apsis moves forwards. When, on the contrary, the force varies more slowly, the apsis has a retrograde motion. Since therefore the force attracting the moon towards the earth increases on the whole, a little more rapidly than the square of the distance decreases, the apsides must have, on the whole, a direct motion. A similar theory is applicable to the mutual perturbations of the primary planets.

The secular acceleration of the moon's mean motion which had long presented a difficulty amounting almost to an exception, against the sufficiency of the theory of gravitation has at last been satisfactorily deduced by M. Laplace from the effect of the gradual change of the eccentricity of the earth's orbit, which is subject to a very slow periodic vibration and which causes a difference in the magnitude of the sun's action on the lunar revolution. **See ACCELERATION.**

The perfect coincidence of the period of the moon's rotation with that of a mean revolution has been supposed to be in some degree an effect of the attraction exerted by the earth on a prominent part of her surface, there are, however, many reasons to doubt of the sufficiency of the explanation. If the periods had originally been very nearly equal we might imagine that the motion of the earth would have produced a libration or oscillation in the position of the moon, retaining it always within certain limits with respect to the earth; no libration is, however, observed that can be derived from any inequality in the moon's rotation, and it has very properly been suggested that the same attraction towards the earth ought to have made the moon's axis precisely perpendicular to the plane of her orbit instead of being a little inclined to it.

The orbits of the comets afford no very remarkable singularity in the application of the laws of gravity excepting the modifications which depend upon their near approach to the parabolic form, and the great disturbance which their motions occasionally suffer, when they happen to pass through the neighbourhood of any of the larger planets. The velocity of a comet in its perihelion is such that its square is twice as great as the square of the velocity of a body revolving in a circle at the same distance. It was deter-

mined by Halley and Clairault, that the attractions of Jupiter and Saturn would delay the return of the comet of 1759 about 618 days, and the prediction was accomplished within the probable limits that they had assigned for the error of the calculation. T. Young's Lectures vol. i. p. 592. See also Biot *Astronomie Physique*, p. 553, and Laplace *Mécanique Céleste*, tomes 1 and 3. See farther the articles **ABERRATION, COMETS, ECLIPSES, PARALLAX, SEASONS, SYSTEM, TIDES, &c.** in this work.

For a view of the solar system, turn to plate 19 and for the telescopic inverted appearances of Mars, Jupiter, Saturn, and the Moon, plate 20. The figures and letters on the moon mark the spots, whose names, &c. are as below, according to Riccioli and Hevelius.

1	Grimaldus	or	Palus Mareotis
2	Caheus		Mons Aduæ
3	Austarchus		Mons Porphyrites
4	Kepleus		Loca paludosa
5	Grædus		Mons Cataractæ
6	Schikardus		Mons Iovæ
7	Herpalus		Insula sinus hyperborici.
8	Heiachides		C. put Mulcris
(b)	Vulcanus		
9	Lausærgius		Insula Malta
10	Reinoldus		Mons Neptunus
11	Copernicus		Mons Ætna
12	Helicon		Insula eroria
13	Capuanus		Regio Cassiotis
14	Bulialdus		Insula Creta
15	Eratosthenes		Insula Vulkanæ
16	Timochares		Insula Corsica
17	Plato		Locus niger major.
18	Archimedes		
(a)	Aratus		
19	Insula sinus medi		
20	Pituitus		Mare mortuum
21	Gycho		Mons Sinai
22	Eudoxus		Mons Carpathes
23	Aristoteles		Mons Scironum
24	Manilius		Insula Berbericus
25	Menelaus		Byzantium
26	Hermes		Mons Bodinus
27	Dionysius		
(a)	Albatagus		Promontorium Acherusia
29	Plinius		Mons Moschi
30	S. Theophilus		Lacus Thospitis
31	Tracastorius		Promontorium acutum.
32	Censorinus		
33	Messali		
34			Promontorium Somnu
35	Proclus		Mons Corax
36	Cleomedes		Montes Riphæi
37	Snellius		Mons Paropamisus
38	Petavius		Petra Sogdiana
39	Ianæcius		Insula Major
40	Tarantius		Sinus Phasianus
A	Mare Humorum		
B	Mare Nubium		
C	Mare Imbrium		
D	Mare Nectaris		
E	Mare Tranquillitatis		
F	Mare Serenitatis		
G	Mare Fœcunditatis.		
H	Mare Crisum		

**ASTROSCOPE**, an astronomical instrument, composed of two cones, on whose surface the constellations, with their stars, are delineated, so that the stars may be known by it

**ASTROSCOPIA**, the art of observing and examining the stars, by means of telescopes.

**ASTRO THEOLOGY** s. (*astrum* and



*theologia, Lat*) Divinity founded on the observation of the celestial bodies (*Derham*.)

**ASTROTIESIA**, is used by some for a constellation or collection of stars in the heavens.

**ASTRUM**, or **ASTRON**, a constellation, or a semblance of stars in which sense it is distinguished from *Aster*, which denotes a single star.

**ASTURIAS**, an ancient kingdom of Spain. It is divided into two parts, *Asturia d Oviedo*, and *Asturia de Sanullana*, and is bounded on the W by *Gilicia*, on the N by the Ocean, on the E by *Biscay*, and on the S by Old *Castile* and *León*. In this province are mines of gold, lapis lazuli, and vermilion. The eldest son of the king of Spain is styled Prince of Asturias.

**ASIYAGHS**. The most celebrated of this name is the son of *Cyaxares*. He was the last king of Media, and was father to *Mindrus*, whom he gave in marriage to *Cambyses*, an ignoble person of Persia, because he was told by a dream, that his daughter's son would dispossess him of his crown. From such a marriage he hoped that none but mean and ignorant children could be raised, but he was disappointed, and though he had exposed his daughter's son by the effects of a second dream, he was deprived of his crown by his grandson, after a reign of 35 years, 550 B.C.

**ASYPAIA** is an ancient geography, an island of Asia in the Cretan sea, where, according to *Cicero*, (*De Nat. Deor. lib. iii. c. 18.*) divine honours were rendered to *Achilles*.

**ASUNDLER** (*asundrun, Sax*) Apart, separately, not together (*Datus*).

**ASYLUM**, (from the privative *α*, and *συλυνω*, I hurt, because no person could be taken from an asylum without sacrilege,) a sanctuary or place of refuge, where a criminal who shelters himself is deemed inviolable and not to be touched by any officer of justice.

Some pretend that the first asylum of Greece was that which was designed by the oracle of *Jupiter Dodonæus*, mentioned by *Pausanias*, who assures us that the Athenians obeyed the oracle, and granted their lives to all those who fled for refuge into the *Areopagus* to the altars of the goddesses.

The same *Pausanias* tells us, that the *Phlians* very much revered a temple of the goddess *Hebe*, to which this privilege was granted, that all criminals should find there the pardon of their crimes, without any exception whatsoever, and that they fastened their chains to trees which were before the temple. This author elsewhere mentions a temple of *Minerva* in *Peloponnesus*, where criminals were so strongly protected, that none durst so much as demand them back again; but this historian has also given us what is more remarkable concerning the antiquity of sanctuaries, or places of refuge for his story, that because *Neoptolemus* the son of *Achilles* had put *Pryamus* to death, although he retired near the altar of *Jupiter Herculeus*, yet he was killed near the altar of *Apollo* of *Delphos*,

from whence it is called the punishment of *Neoptolemus*, when one suffers the same mischief which he had done to another. Thus the asyla of altars and of temples was ancient in this time. About the time of *Solomon*, and of the foundation of the temple of *Jerusalem*, there is an asylum mentioned in the Book of *Kings*.

But the asylum of the altar among the *Israelites* is far more ancient than that of the temple of *Solomon*, and the time of *Homer* or the *Trojan war*, for it is mentioned in *Exodus*, as a thing established in *Moses's* days.

The asylum of the temple of *Diana* at *Ephesus*, was one of the most famous. *Strabo* tells us, that several princes allowed it sometimes a year, or, and sometimes a less extent beyond the temple itself.

There were whole cities of refuge among the *Israelites*, which were counted asyla, also the league of the people of *Smyrna* with king *Selucus* shews us, that king granted the privilege of being an asylum to the whole city of *Smyrna*.

The whole island of *Samothrace* likewise enjoyed the same privilege, according to *Livy*.

*Herodotus* assures us, that from the *Trojan war* there was a temple of *Hercules* in *Egypt*, whither bond slaves fled, and after they had received the marks or badges of that god, to whom they had devoted themselves, they could never be retaken by their masters.

The emperors *Honorius* and *Theodosius* granting the like immunities to churches, the bishops and monks laid hold of a certain tract or territory without which they fixed the bounds of the secular jurisdiction; these privileges were soon extended not only to the churches and churchyards, but also to the bishops' houses, whence the criminal could not be removed without a legal assurance of life, and an entire remission of the crime. But in the course of time these asyla, or sanctuaries were stripped of most of their immunities, because they served to make guilt and libertinism more abandoned. See *LISTS OF REFUGE*.

**ASYMMETRY**, the want of proportion, otherwise called incommensurability, or the relation of two quantities which have no common measure, as between 1 and  $\sqrt{2}$ , or the side and diagonal of a square.

**ASYMPTOTE**, (from a privative *α*, and *συλυνω*, I fall, incoincident,) is properly a right line, which approaches continually nearer and nearer to some curve, whose asymptote it is said to be, in such sort, that when they are both indefinitely produced, they are nearer together than by any assignable finite distance, or it may be considered as a tangent to the curve when conceived to be produced to an infinite distance. Two curves are also said to be asymptotical, when they thus continually approach indefinitely to a coincidence; thus, two parabolas, placed with their axes in the same right line, are asymptotes to one another.

Of lines of the second kind, or curves of the first kind, that is, the conic sections, only the

# ASYMPTOTE

hyperbola has asymptotes, which are two in number. All curves of the second kind have at least one asymptote, but they may have three. And all curves of the third kind may have four asymptotes. The conchoid, cissoid, and logarithmic curve, though not reputed geometrical curves, have each one asymptote. And the branch or leg of a curve that has an asymptote, is said to be of the hyperbolic kind.

The nature of asymptotes will be easily conceived from the instance of the asymptote of the conchoid. Thus, if ABC, &c. be part of a conchoid, and the line MN be so drawn that the parts FB, GC, HD, IL, &c. of right lines, drawn from the pole P, be equal to each other, then will the line MN be the asymptote of the curve, because the perpendicular CC' is shorter than LB, and DD' than CG, &c., so that the two lines continually approach, yet the points Lc &c. can never coincide. Pl. 6.

ASYMPTOTES, by some, are distinguished into various orders. The asymptote is said to be of the first order, when it coincides with the base of the curvilinear figure. Of the 2d order, when it is a right line parallel to the base. Of the 3d order, when it is a right line oblique to the base. Of the 4th order, when it is the common parabola, having its axis perpendicular to the base. And, in general, of the  $n+2$  order, when it is a parabola whose ordinate is always in the  $n$  power of the base. The asymptote is oblique to the base, when the ratio of the first fluxion of the ordinate to the fluxion of the base approaches to an assignable ratio, as its limit, but it is parallel to the base, or coincides with it, when this limit is not assignable.

The areas bounded by curves and their asymptotes, though indefinitely extended, have sometimes limits to which they may approach indefinitely near, and this happens in hyperbolas of all kinds, except the first or Apollonian, and in the logarithmic curve, as was observed above. But in the common hyperbola, and in many other curves, the asymptotical area has no such limit, but is infinitely great. Solids, too, generated by hyperbolic areas, revolving about their asymptotes, have sometimes their limits, and sometimes they may be produced till they exceed any given solid. Also the surface of such solid, when supposed to be infinitely produced, is either finite or infinite, according as the area of the generating figure is finite or infinite.

The way of discovering whether curves proposed have asymptotes, and the manner of drawing them when they are inclined to the axis, may be easily derived from the method of tangents, as in the following example. Let the curve be ADE (fig. 6 pl. 6) with the

equation  $\frac{ay^{m+n}}{b} = m(a+x)^n$  the substance of which is found to be

$TB = \frac{(m+n)(a\tau + x\tau)}{m a + (m+n)x}$  Then the intercepted line AT.  $\frac{(m+n)(a\tau + x\tau)}{m a + (m+n)x}$  x, that

is  $= \frac{na\tau}{m a + (m+n)x}$  Now it is plain that the tangent TD will become an asymptote when, touching the curve at an infinite distance, that is, when the absciss AB =  $\tau$  becomes infinite the intercepted line AI (then = AM) shall remain finite. But, putting  $x$  infinite in the expression of AT, the first term  $ma$  of the denominator, is infinitely less than the other, and therefore vanishes. Whence, in this case, it will be  $\frac{na\tau}{(m+n)\tau}$ , or  $\frac{na}{m+n}$ , which is a finite quantity. So that the curve has an asymptote, which will pass through the point M, making

$AM = \frac{na}{m+n}$  Now, to draw it, let AII be raised perpendicular to AB, and let the asymptote be for example MII. This being supposed, if we take  $x$  infinite, it will be  $\tau = y = MA$  AII, and on the supposition of  $x$  being infinite, the equation of the curve above given,  $a$  being then as nothing in respect of  $\tau$ , will be

transformed into this,  $\frac{ay^{m+n}}{b} = a^{m+n}$  OI,

extracting the root, and for convenience, making  $m+n = t$ , it will be  $y \sqrt[t]{a} = a \sqrt[t]{b}$ , and, taking the fluxions  $y \sqrt[t]{a} = \tau \sqrt[t]{b}$  so that,  $x \sqrt[t]{a} = \tau \sqrt[t]{b}$  Whence MA AII

$\sqrt[t]{a} \sqrt[t]{b}$ , and because MA =  $\frac{na}{t}$  we shall have  $\frac{na}{t} \sqrt[t]{b} = \tau \sqrt[t]{a}$ , or AII =  $\frac{na}{t}$

$\sqrt[t]{b}$  If, therefore, we take  $AM = \frac{na}{t}$ , and

raise the perpendicular AII =  $\frac{na}{t} \sqrt[t]{b}$ , the indefinite right line MII drawn through the points M and H will be the asymptote of the curve ADE.

If  $m$  and  $n$  be each = 1, the curve becomes the Apollonian hyperbola whose equation is  $\frac{a}{b} y^2 = (a+x)\tau$  then will  $t = 2$ , and there-

fore  $AM = \frac{1}{2} a$ , and  $AH = \frac{1}{2} a \sqrt{\frac{b}{a}} = \frac{1}{2} \sqrt{ab}$  That is AM is half the transverse axis, and AH half the conjugate results corresponding with what are shewn in treatises of conic sections.

Again, suppose ADE in the same figure to be a curve whose equation is  $y^3 - \tau^3 = aay$ , making AB =  $a$ , BD =  $y$ . By taking the fluxions we shall have  $3y^2 y' - 3\tau^2 \tau' = aay'$  +  $ayx$ , and therefore  $\frac{y'x}{y} = \frac{3y^3 - aay}{3x\tau + ay}$ , and

$AT = \frac{y}{\tau} - \tau = \frac{3y^3 - 3\tau^3 - 2aay}{3x^2 + ay}$  Or, in-

stead of  $3y^3 - 3\tau^3$ , putting its value  $3aay$  from the equation of the curve, it will be  $AT = \frac{aay}{3x^2 + ay}$  Then, making  $x$  infinite, to

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but the case of an asymptote, in which AT becomes AM, the term  $ay$  is nothing in respect of  $3x^2$ , so that we shall have  $AM = \frac{ay}{3x^2} = \frac{ay}{3x}$

But, because in the proposed equation the indeterminates cannot be separated, nor consequently the value of AM determined, it we

put  $AM = \frac{ay}{3x} = s$  (an expedient which may be adopted in other such cases) we shall have  $y = \frac{3sx}{a}$ , and this value substituted for  $y$  in

the proposed equation,  $27s^2x$   
 $3sx^2$  or  $\frac{27s^2x}{a} - a = 0$  But, since  $x$  is infinite, the last term will be as nothing with regard to the others, so that it will be  $\frac{27s^2x}{a} - a = 0$ , whence  $s = \frac{1}{3}a$  Taking

therefore  $AM = \frac{1}{3}a$ , the asymptote must be drawn through the point M. Moreover, it must be  $MA : AH :: x : y$ , and the proposed equation will be reduced to  $x^2 = y$ , or  $x = y$ , when  $a$  is infinite, and therefore  $x = y$ . Consequently, making  $MA = AH$ , the right line drawn through M and H will be the asymptote sought.

For examples of the method of drawing asymptotes when the coordinates are not rectangular, see Agnesi's Institutions, book II. Maclaurin's Fluxions, book I. ch. 10. Cramer's Introduction à l'Analyse des lignes courbes, art. 147, &c.

ASYNDETON, in grammar a figure which omits the conjunctions in a sentence as in *venit, vidi, vici* where *et* is left out or in that of Cicero concerning Catiline, *ambit, excessit, evasit, erupit*.

AT *prep* (æt, sixon) 1 *At*, before a place, notes the nearness of the place as a man is *at* the house before he is *in* it (*Shakespeare*) 2 *At*, before a word signifying time, notes the coexistence of the time with the event he rose *at* ten (*Swift*) 3 *At*, before a causal word, signifies nearly the same as *when* he did it *at* a touch (*Dryden*) 4 *At*, before a superlative adjective, implies in the state as, *at best*, in the state of most perfection, &c. (*South*) 5 *At* signifies the particular condition of the person as, *at peace* (*Swift*) 6 *At* sometimes marks employment or attention busy *at* his task (*Pope*) 7 *At* is sometimes the same with *furnished with* as a man *at arms* (*Shakespeare*) 8 *At* sometimes notes the place where any thing or body is, he lives *at* Barnet (*Pope*) 9 *At* sometimes signifies an immediate consequence of he swooned *at* the sight (*Hale*) 10 *At* marks sometimes the effect proceeding from an act he cuts *at* his own coat (*Dryden*) 11 *At* sometimes is nearly the same as *in*, noting situation he was *at* the top (*Swift*) 12 *At* sometimes marks the occasion, like *on* he comes *at* call

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(*Dryden*) 13 *At* sometimes seems to signify in the power of, or obedient to (*Dryden*) 14

*At* sometimes notes the relation of a man to an action (*Collier*) 15 *At* sometimes imports the manner of an action (*Dryden*) 16

*At* means sometimes application to, or dependence on (*Pope*) 17 *At all* In any manner (*Pope*)

A TABAL s A kind of labour used by the Moors (*Dryden*)

A FAIR, in astronomy See ALCAIR

A GALANIA, in fabulous history, a daughter of Schoeneus, king of Scyros. Ancient fabulists have differed much in their accounts of her. According to Ovid she was born in Arcadia, and she determined to live in perpetual celibacy, but her beauty gained her many admirers, and to free herself from their importunities she proposed to run a race with them. They were to run without arms, and she was to carry a dart in her hand. Her lovers were to start first, and whoever arrived at the goal before her would be made her husband, but all those whom she overtook were to be killed by the dart with which she had armed herself. As she was almost invincible in running, many of her suitors perished in the attempt. All Hippomenes proposed himself as her admirer. Venus hid presented him with three golden apples from the garden of the Hesperides, and as soon as he had started in the course, he artfully threw down the apples at some distance one from the other. While Atlanta, charmed at the sight, stopped to gather the apples, Hippomenes, hitherto on his course, arrived first at the goal, and obtained Atlanta in marriage. These two fond lovers, in the impatience of consummating their nuptials, entered the temple of Cybele, and the goddess was so offended at the profanation of her house, that she changed them into two lions.

ATAMASCO LII Y See AMARYLLIS

ATARAXIA A'TARAXY s (LXemption from vexation, tranquillity (*Glanville*))

ATARNFA, an ancient town of Mysia, situated between Adramyttium and Pitine. remarkable for the marriage of Aristotle with the sister or concubine of the tyrant Hiermas, also for the dotage of that philosopher.

ATAXIA, (*ataxia, αταξία*, from *α*, neg. and *ταξις*, to order) Want of regularity in the symptoms of a disease, or of the functions of an animal body.

ATCHE, in commerce, a small silver coin current in the states of the Grand Seigneur, equivalent to about a third part of the English penny.

ATCHIEVEMENT, or ACHIVEMENT, in heraldry, denotes the arms of a person or family, together with all the exterior ornaments of the shield, as helmet, mantle, crest, scrolls, and motto, together with such quarterings as may have been acquired by alliances, all marshalled in regular order.

ATE The preterit of eat  
 ATE, a termination adopted by the authors of the new chemical nomenclature, to express an extensive class of neutral salts which are

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formed by the union of acids perfectly saturated with oxygen, with earthly, alkaline, or metallic bases. When the acids have an excess of base, i. e. are not completely saturated with oxygen, the salts formed by their combination with the preceding bases, are denoted by the termination *ite*. Thus the salts composed of nitric acid and a base, are termed nitrates, while those resulting from nitrous acid and similar bases, are called nitrites. See *ITE* and *NOMENCLATURE*.

**ATE**, in heathen mythology, a goddess, who perverted men's understanding, clouded their reason, and delighted herself in involving them in misfortunes and engaging them in quarrels. There was no way to be secured from her, but by having recourse to the *Lites*. This goddess was daughter of Jupiter, and cast down from heaven at the birth of Hercules. For Juno having deceived Jupiter, in causing Euristheus to be born before Hercules, Jupiter expressed his resentment on Ate, as the author of that mischief, and threw her headlong from heaven to earth, swearing she should never return thither again (Homer. II. xix. 125.) The name of this goddess comes from *αττω*, *noceo*, *to hurt*. Her being the daughter of Jupiter means, according to mythologists, that no evil happens to us but by the permission of providence, and her banishment to earth denotes the terrible effects of divine justice among men.

**ATLGAR**, a kind of hand-dart used by the Saxons.

**AIELI ANF**, in antiquity, a kind of comic and satiric pieces, presented on the Roman theatre. They had their name from Atella, a city of Tuscany where they were first represented.

**A TEMPO GIUSTO**, in music, directs to sing or play in an equal, true, and just time.

**ATH**, among the Saxons, a purifying oath.

**ATHAMABULEI**, the prime minister of the Persian empire, as the grand vizier is of the Turkish empire. He is great chancellor of the kingdom, and president of the council.

• **ATHAMANIA** Spiguel stone-parsley a genus of the class and order pentandrii, digynia. Fruit ovate, oblong, convex, striate, petals nearly uniform, inflected so as to seem notched, calyx entire. Eleven species, European plants.

**ATHAMANTA CRETENSIS**. The systematic name for the daucus creticus of the pharmacopœias. See *DAUCUS CRETICUS*.

**ATHAMANTIA OREOSFLINUM**. The systematic name for the officinal oreoselinum. See *OREOSFLINUM*.

**ATHANASIA**. In botany, a genus of the class and order syngenesia, polygamia æqualis. Receptacle chaffy, seeds crowned with very short bristly chaff, calyx imbricate. Twenty-one species, all of the Cape.

**ATHANASIAN CREED**. See *CREED*.

**ATHANASIUS** (St.), was born in Alexandria. He distinguished himself so much at the council of Nice, that on the death of Alexander, bishop of Alexandria, he was chosen to succeed him in 326, when he was about 28

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years of age. He had been greatly persecuted by the Arians before his consecration, and now their rage against him was redoubled, particularly as he refused to admit their leader into the church, though he was commanded to do so by Constantine.

In 335 he was deposed by the council of Tyre when, having recourse to the emperor Constantine, the Arian deputies accused him of having hindered the exportation of corn from Alexandria to Constantinople, on which the emperor, without suffering him to make his defence, banished him to Treves. The emperor, two years after, gave orders that he should be restored to his bishopric. But, on his return to Alexandria, his enemies brought fresh accusations against him, and chose Gregory of Cappadocia to his see, which obliged Athanasius to go to Rome to reclaim it of pope Julius. He was there declared innocent, in a council held in 342, and in that of Sardica in 347, and two years after was restored to his see by order of the emperor Constantine, but after the death of that prince, he was again banished by the emperor Constantius, which obliged him to retire into the deserts. The Arians then elected one George in his room, who being killed in a popular sedition under Julian, in 360, St. Athanasius returned to Alexandria, but was again banished under Julian, and restored to his see under Jovian. He addressed to that emperor a letter, in which he proposed that the Nicene creed should be the standard of the orthodox faith, and condemned those who denied the divinity of the Holy Ghost. He was also banished by Valens in 367, and afterwards recalled. St. Athanasius died on the 2d of May, 373.

His works principally contain a defence of the mystery of the Trinity, and of the incarnation and divinity of the Word and Holy Spirit. There are three editions of his works which are esteemed, that of Commelin, printed in 1600, that of Peter Nannius, in 1627, and that of father Montfaucon, in 3 vols. fol. 1698. The creed which goes by his name is supposed to have been compiled by an African bishop, in the 5th century.

The historian Gibbon speaks much at large on the talents, learning and character of Athanasius, concluding by saying "It was not only in ecclesiastical assemblies, among men whose education and manners were similar to his own, that Athanasius displayed the ascendancy of his genius: he appeared with easy and respectful firmness in the courts of princes, and on the various turns of his prosperous and adverse fortune, he never lost the confidence of his friends, or the esteem of his enemies."

**ATHANATA**, (from the primitive *α* and *θανος* death,) immortals, an order of soldiers among the ancient Persians.

**ATHANOR**, a kind of furnace used by the ancient chemists, for the purpose of keeping up a long continued heat, without the necessity of constant attendance. The heat is preserved by a supply of charcoal which, being put in at

the top or tower of the athanor, falls down by degrees, as the fire in the grate underneath is consumed. This apparatus was particularly used by the alchemists in their researches after the art of making gold, the universal medicine, &c. Since their time, it has fallen into disuse, though there are particular operations and experiments in chemistry in which it might probably be employed with advantage.

**ATHAPESCOW**, a lake of North America, 100 miles long, and from ten to thirty wide. Lon 110 W Greenwich Lat 59 N.

**ATHBAY**, a town of Ireland, in the county of Meath, a borough which returned two members to the Irish parliament twenty-nine miles N W Dublin.

**ATHEISM** *s* (from *atheist*) The disbelief of a God.

The learned and eloquent Dr Parr, in the notes to his celebrated Spital Sermon, has very ably stated the different operations of atheism and superstition. It is not his intention to plead either directly or indirectly the cause of superstition, to palliate its absurdities, or to varnish over its crimes, but to contrast the effects of two acknowledged evils, and to shew that from atheism naturally result consequences more direful than from superstition. The passage, though very interesting, is too long to be inserted here. It may be seen in the notes to the Spital Sermon, p. 97, 99.

**ATHEIST** *s* (from the privative *a* and *theos*, God) A person who does not believe the existence of a deity, or a providence.

Atheists are speculative and practical. A reasonable creature who disbelieves the being of a God, or thinks it inconsistent with sound reason to believe that the great first cause is perfect in holiness, power, wisdom, justice, and beneficence, is a speculative atheist, and he who endeavours to instil the same unbelief into others, is a practical atheist.

A very admirable writer of much taste and genius has recently sketched the progress by which atheists ascend the dreary eminence where they "look with so much complacency up to a vacant heaven, and down to the gulf of annihilation." In the course of his enquiry he has suggested an argument which being at the same time original, popular, and convincing, shall be given in this place.

Surely, says this able author, the creature that lifts his voice and defies all invisible power within the possibilities of infinity, challenging whatever unknown being may hear him, and may appropriate that title of almighty which is pronounced in scorn, to evince his existence, if he will, by his vengeance, was not as yesterday a little child, that would tremble and cry at the approach of an insignificant repule.

But, indeed, it is heroism no longer, if he knows that there is no God. The amazement then turns on that great process by which a man could grow to the piercing and immense intelligence that can know, or without match-assumption assume, that there is no God. At age, and what lights, are requisite for attainment? This intelligence involves the

very attributes of divinity, while a God is denied. For unless this man is omnipresent, unless he is, at this moment, in every place in the universe, he cannot know but there may be in some place manifestations of a deity by which even he would be overpowered. If he does not know absolutely every agent in the universe, the one that he does not know may be God. If he is not himself the chief agent in the universe, and does not know what is so, that which is so may be God. If he is not in absolute possession of all the propositions that constitute universal truth, the one which he wants may be, that there is a God. If he cannot with certainty assign the cause of all that exists, that cause may be God. If he does not know every thing that has been done in the immeasurable ages that are past, some things may have been done by a God. Thus, unless he knows all things, that is, precludes another Deity, by being one himself, he cannot know that the being whose existence he rejects, does not exist. But he must know that he does not exist, else he deserves ineffable contempt for the madness with which he firmly avows his rejection, and acts accordingly. See Foster's Essays, vol I Essay 1 passim.

Cicero represents it as a probable opinion, that they who apply themselves to the study of philosophy believe there are no gods. This must, doubtless, be meant of the academic philosophy, to which Cicero himself was attached, and which doubted of every thing. On the contrary, the Newtonian philosophers are continually recurring to a Deity, whom they always find at the end of their chain of natural causes. Some foreigners have even charged them with making too much use of the notion of a God in philosophy, contrary to the rule of Horace. *Nec Deus in uris, nisi dignus vindice nodus*. Among us, the philosophers have been the principal advocates for the existence of a Deity. Witness the writings of sir Isaac Newton, Boyle, Ray, Cheyne, Nieuweny, Euler, Hartley, Robison, &c. To which may be added many others, who, though of the clergy (as was also Ray), yet have distinguished themselves by their philosophical piece in behalf of the existence of a God, *e gr* Derham, Bentley, Whiston, Samuel and John Clark, Feignon, Paley, &c. So true is that saying of lord Bacon, that though a smattering of philosophy may lead a man into atheism, a deep draught will certainly bring him back again to the belief of a God and Providence.

**ATHEIST** *a* Atheistical, denying God (Milton).

**ATHEISTICAL** **ATHEISTICK** *a* (from *atheist*.) Given to atheism, impious (Southey).

**ATHEISTICALLY** *ad* (from *atheistical*) In an atheistical manner (Southey).

**ATHEISTICALNESS** *s* (from *atheistical*) The quality of being atheistical (Ham).

**ATHEOUS** *a* (*atheos*.) Atheistick, godless (Milton).

**ATHELING, ADELING, EDLING, ETH- LING, or ETHELING**, among the Anglo-

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Saxons, was a title of honour, properly belonging to the heir apparent, or presumptive, to the crown

**ATHELNEY**, a river island of Somersetshire, at the confluence of the Thone and Parret, memorable for having afforded shelter, amid its inaccessible morasses, to the illustrious king Alfred. Here he collected some of his retainers, on which account, he called it *Æthelingay*, or the Isle of Nobles, and hence he made frequent and unexpected sallies upon the Danes

**ATHELSTAN**, or **ÆTHESTAN**, (son of Edward surnamed the Elder, king of the West Saxons, and of Edgiva, a shepherd's daughter,) succeeded his father in 924, he defeated Anlaf, king of Northumberland, whose army consisted of Scots, Picts, Danes, and Norwegians, and obtained such reputation, that the emperor Henry, surnamed the Fowler, sent to demand one of his sisters in marriage for his son Otho, Hugo, king of the Franks, also desired another for his son, and Lewis, prince of Aquitain, sent an embassy to desire a third for himself. He was equally successful against the Welsh, for having beaten them in the field, he caused Lïdwal, king of Wales, with his petty princes, to meet him at Hereford, where they did him homage, and promised to pay him a yearly tribute. The greatest blemish in the reign of Athelstan is supposed to be his treatment of his brother Eadwin, whom he suspected of having a design to deprive him of his crown, for it is certain, he caused him to be put on board a leaky ship, with his armour-bearer and page, when the young prince, unable to bear the severity of the weather and want of food, drowned himself. Athelstan, however formed many wise laws, and rendered himself much admired on account of his wisdom, wealth, and the extent of his dominions. He reigned about sixteen years, and died at Gloucester, in 942

**ATHYMENES**, in fabulous history, son of Catreus, king of Crete, who was informed by an oracle that he should kill his father, he therefore left him, and retired to Rhodes, where he built the temple of Atamyrius, upon a mountain of the same name, when his father coming thither in search of him, he killed him without knowing him

**ATHENÆA**, in botany, a genus of the class and order octandria monogynia. Calyx colour ed, five parted, corol none, bristles eight, flattened between the filaments, stigma five-parted, capsule globose, one-celled, three-valved, seeds three to five. There is one species, a branching shrub of Guinea, the bark, leaves, and fruit, are sharp and aromatic, called *caffè diable* by the Creoles

**ATHENÆA**, a feast celebrated by the ancient Greeks in honour of Minerva

**ATHENÆUM**, in antiquity, a public place where the professors of the liberal arts held their assemblies, the rhetoricians declaimed, and the poets rehearsed their performances. The three most celebrated *athenæa* were those

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at Athens, at Rome, and at Lyons, the second of which was built by the emperor Adrian

**ATHENÆUS**, a physician, born in Cilicia, contemporary with Pliny, and founder of the pneumatic sect. He taught that the fire, air, water, and earth, are not the true elements, but that their qualities are, viz. heat, cold, moisture, and dryness, and to these he added a fifth element, which he called spirit, whence his sect had its name

**ATHENÆUS**, a Greek grammarian, born at Naucratis in Egypt, in the 3d century, one of the most learned men of his time. Of all his works we have none extant but his *Deipnosophis*, i. e. the *Sophists at Table*, there is an infinity of facts and quotations in this work which render it very agreeable to admirers of antiquity

The best editions of this author are those of Isaac Casaubon, in 1597 and 1612-57, and of Schweighæuser, in 1801. An interesting account of the materials from which Schweighæuser compiled his edition, is given in the *Monthly Magazine* for January, 1803

There was also a mathematician of this name, who wrote a treatise on mechanics, which is inserted in the works of the ancient mathematicians, printed at Paris in 1693, in folio, in Greek and Latin

**ATHENAGORAS**, an Athenian philosopher, flourished about the middle of the 2d century, and was remarkable for his zeal for Christianity, and his great learning, as appears from the *Apology* which he addressed to the emperors Marcus Aurelius Antoninus and Lucius Commodus

**ATHENODORUS**, a famous stoic philosopher, born at Tarsus, went to the court of Augustus, and was made by him tutor to Libertus. Augustus had a great esteem for him, and found him by experience a man of virtue and probity. He used to speak very freely to the emperor. He, before he left the court to return home, warned the emperor not to give himself up to anger, but, whenever he should be in a passion, to rehearse the 24 letters of the alphabet before he resolved to say or do any thing. He did not live to see his bad success in the education of Tiberius

**ATHENOPOLIS**, a town of the Massiliensis, an ancient nation of Gaul. It is conjectured by Harduin to be the same with *Telo Martius*, now Toulon, by others, to be the same with *Antipolis* or *Antibes*

**ATHENS**, in ancient geography, the most famous city of Greece, situated in that part of Achaia, which lies upon the coast, from whence it was called *Acte*, and afterwards *Attica*. The first founder of it is said to be Cecrops in the time of Moses, whence it was called *Cecropia* or *Ionia*, from Ion the son of Xuthus, and afterwards Athens from Minerva, *Ἀθήνη*, in Greek, signifying Minerva. This city was famous for learning and eloquence, and the defence of all Greece, says Lucian in his *Praise of Demosthenes*. "I might," adds he, "speak of the Gods, to whom it owes its beginning,

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their affairs, decrees, dwellings, presence and mysteries I might speak of its laws, decrees, assemblies, colonies, victories and trophies, which are so great and many, as well by sea as by land, that he must be more eloquent than Demosthenes, who can sufficiently describe them."

It was governed by kings, for the space of 460 years, of whom the first was Cecrops; but their power degenerating into tyranny, the people shook off the regal yoke, which ended in Codrus. They were governed for a long time after by 500 magistrates, named prytanes, who ruled by turns, 50 at a time, and after by nine magistrates, of whom the chief was called Archon. This government did not continue above 460 years, and their commonwealth or somewhat like it being often interrupted by tyrants, who assumed an absolute authority.

Varro gives this account of the original of the word Athens. "An olive tree," says he, "growing up out of the earth on a sudden in a certain place, and a spring of water rising in another, these prodigies astonished the king, who sent to Apollo at Delphos to know the signification of them, and what he should do. The oracle answered that the olive tree signified Minerva, and the water Neptune, and it belonged to them to see from which of those two Gods they would name their city.

"Hereupon Cecrops assembled all his citizens, as well men as women (for the women at that time had a voice in their councils). When they came to vote, all the men were for Neptune, and all the women for Minerva (and because there was one woman more, Minerva carried it, and the city was named Athens, which is taken from that of Minerva, whom the Greeks call Ἀθηνᾶ. Neptune being incensed at it depopulated the country of the Athenians with his traves, and to appease him, says the same author, the women suffered three sore punishments: First, that from that time they should never have a voice in their councils, the second that none of their children should bear their name, and lastly, that they should not be called Athenians but *Atticks*."

The old city, or citadel, was sixty stadia, or about 24 leagues in circuit, it was fenced with wooden pales, and, as some say, set about with olive trees, besides being fortified with a strong wall. The inside of the citadel was adorned with innumerable edifices, statues and monuments. The lower city comprehended all the buildings that surrounded the citadel, together with the harbours of Phalerum, Munchize, and the Piræus. The whole circuit of the city, in its most flourishing state, was not less than about 22 Roman miles.

Ancient Athens, however, though containing many noble buildings, was by no means so magnificent in its general appearance as many moderns are inclined to suppose. On entering the city, says Dicaearchus the disciple of Aristotle (in his fragment entitled *Περὶ Ἀθηνᾶς*) no person would imagine himself at Athens

the streets, he adds, are strikingly irregular, the town in general badly provided with water, and, although some houses appear more convenient than others, yet all of them are wretched. It is only when arrived at the theatre, continues he, and on discovering the grand temple of Minerva, that the incertitude begins to vanish, which was produced by the excessive disproportion between the real state of the city, and the splendour of their reputation.

An inherent defect in the construction of houses in Athens occasioned great inconvenience. The stairs were erected in the street, and the upper apartments, projecting over the street, disfigured the façades, obstructed the view, and prevented a free circulation of air. All this arose from the avarice of the proprietor, who, by placing galleries over the heads of the passers, endeavoured as much as possible to gain possession of the very streets. (Aristotle *Œconomica*, lib. ii. Polyænus *Strat.* lib. iii.) Amongst us, says I unspies, it is a general rule with architects never to adorn the roofs of houses, nor to render them at all remarkable (*Hippolyt.*). An edifice too highly decorated or distinguished by a little more than common elevation, must necessarily have attracted a crowd of jealous observers, and suggestions would not have been wanting that this ostentation denoted a pride incompatible with republican equality. Another circumstance tended still further to the deformity of Athens: many spots, according to Xenophon, remained vacant, where the habitations had either been destroyed by fire, or erased by a defect of the people (*Ire it on Finances*). No sooner was a citizen accused of high treason, or some such crime, than immediately his house was demolished, as a vessel is broken which has contained poisonous liquor. Neither was it lawful to rebuild there, for the very ground was supposed to become fatal and execrable, from the crime of its former possessors.

As to the real extent of Athens, it is certain that the ramparts sixty stadia in circumference, far exceeded what would have been necessary, had the nation in time of war possessed any other place of refuge. On such distressing occasions, inhabitants from the country, who had no dwellings, constructed in the openest places a number of huts, resembling in figure the hives of bees. Aristophanes, who had seen these miserable sheds during the Peloponnesian war, compares them (comedy of the Knights) to those earthen urns called casks, which were in use among the Greeks. Exclusive of such dwellings, erected for the moment, all the houses in Athens did not, as Xenophon positively attests (*Œconom.* lib. iii.) exceed ten thousand, and thus the total number of inhabitants may be set down at about fifty thousand, including both slaves and strangers.

The excess of magnificence displayed in the temples and public edifices rendered the wretchedness of the private buildings more conspicuous. The eye was carried rapidly from one



extreme to the other, without finding any thing intermediate on which to repose, and thus evil, instead of diminishing, became constantly more prevalent. As no connexion or proportion subsisted among the parts, it was impossible that the whole could produce any beautiful effect. The three thousand statues erected in the public places, and under the porticos of Athens, did not conceal the deformity of the streets, because a profusion of ornaments can never compensate for misery. The passion for porticos and colonnades was very great, but their effect must have been considerably diminished by the shade of so many trees planted by the Greeks quite in the centre of their towns. From this desire of preserving at least the image of a country life, Athens was encumbered with plane trees, and the shade of the olive concealed the monuments of Megara from the view of travellers. From this sketch the reader may easily judge, that Athens, however celebrated for learning, sciences, and arts, for the finest specimens of sculpture, and the utmost magnificence of architecture, by no means deserved the character which some moderns have given it, of being unequalled in beauty.

The modern city is called Scione, and is now the see of a Greek bishop with several churches, but inconsiderable if compared with its ancient splendour. It contains about fifteen or sixteen thousand inhabitants, chiefly Greeks. It was taken by Mahomet II, in the year 1453; the Venetians took it from the Turks in 1464 and 1687, but were compelled to abandon it, and the Turks are now masters of it with the rest of the country. The chief articles of trade are silks, wax, wool, and oil. It is a seaport, and situated on the north east coast of the gulf of Engiri, in the Archipelago, with a safe and large harbour, the entrance, which is narrow, is commanded by the citadel, the ancient Acropolis sixty miles SE. Tivadia, and 304 SW. Constantinople. Lat 38, 5 N. Lon 23, 57 E.

**ATHENIANS**, the people who inhabited the capital of ancient Attica called Athens.

The Athenians, says Plian, wore purple garments, having their hair tied with ribbons of gold and silver, adorned with golden grasshoppers.

Thucydides in the beginning of his history, calls the Athenians, *perithoiotai*, that is to say, wearers of grasshoppers, and the reason he gives for it is this. He says it was to distinguish free-men from slaves. Lucian tells us the same thing. Iretes teaches us that the grasshoppers, which the Athenians wore were to show, that they were great speakers, and very prolix in their discourse.

Those who wish to know more concerning Athens and the Athenians, may consult Stewart's Athens, Spion Voyage en Grèce, tome ii, Chandler's Travels into Greece, Wheeler's do., Gibbon's Hist. vol. xi., De Pauw's Descriptions of the Greeks, and Gillies's Greece.

**ATHIRDFI** See **ARDEE**

**ATHERINA** (*athirine*) In zoology, a

genus of the class pisces, order abdominalia. Upper jaw a little flat, gill membrane, six-rayed, sides with a silvery stripe. Five species in the different seas of the globe. (See Nat. Hist. pl. XXIV.) Of these the only one worthy of notice is the *menidia*, silver fish, so often introduced into our marble basins, and globular glasses for ornament. It is an inhabitant of the fresh waters of Carolina, body small, pellucid, scales spotted with black, teeth numerous on the lips, but none in the jaws or tongue. lateral line silvery, tail forked.

**ATHEROMA**, (*atheroma*, *αθηρωμα*, *pulse*, *pap.*) An encysted tumour that contains a soft substance of the consistence of a poulitice.

**ATHEROMATOUS** *a* (from *atheroma*) Having the qualities of an *athicroma*, or eurdy wen (*Wismen*).

**ATHIRSTON**, a town of Warwickshire, having a market on Tuesdays. Lat 52 40 N. Lon 1 30 W.

**ATHINI**, or **SPTINFs**, modern Athens.

**ATHIRST** *ad* (from *a* and *thirst*) Thirsty, in want of drink (*Dryden*).

**ATHLETÆ**, wrestlers, or combatants, courageous and strong men, who addicted themselves to bodily exercises, is running, fighting, and others of like natures, among the Greeks and Romans, and for whom the ancients appointed prizes.

These athletes were in great esteem among the Greeks, but were in disrepute at Rome, for some time Ulpian the lawyer freed them from the marks of infamy.

This is the way by which they were matched in the plays of the Circus. "They took an earthen pot into which they put certain balls about the bigness of a bean, on which was set an A, or a B, or some other letter, and always two letters alike. Then the champions came forth one after another, and made their prayer to Jupiter before they drew, and then put their hands into the pot, but the herald of the plays stretching out his rod hindered them from reading their tickets till they were all drawn. Presently one of the judges, or some other person took every one's ball, and joined them together who had the same letters, if the number of the athletes were odd, he that had the single letter was to fight with the conqueror, which was no small advantage, because he came fresh to the combat with him who was weary. Their food was barley bread, which was the reason they were called *hordearii*, i. e. barley eaters, and also another sort of bread, called *colphea*, of *αλλυ*, *menhira*, and *σπια*, *robusta*, because it made their bodies strong and robust. Some fed them with soft cheese, and Dromicus was the first who fed them with meat, according to the testimony of Pausanias in his *Ellice*.

Montesquieu and various other moderns have ascribed many fancied advantages to the exercises of the *athletæ*, but we should cautiously avoid laying much stress upon their opinion, when it is recollected that it is in direct opposition to that of all the ancient physicians. These athletes augmented the force of

particular members, to the detriment of the whole, and thus produced some peculiar deformity, and destroyed the proper equilibrium of the bodily powers. Thus, the wrestlers and boxers became of a prodigious size from their loins upwards, while their legs and thighs were remarkably slender: and with the diacuboles, the carnosity of the arms became monstrous, and the neck nearly inflexible. Therefore, Galen attests in the most positive manner, that no physician since the time of Hippocrates ever approved of the frame, constitution, or regimen of the athleteæ. And Solon taught the Athenians that it was infinitely more advantageous to employ the money of the state in providing for orphans, than in nourishing a race of men who were equally useless in peace and war. For the athleteæ, as Euripides declares, were the worst soldiers in Greece.

**ATHLETICK** *a* (from *athleta*, Latin) 1 Belonging to wrestling 2 Strong of body; vigorous, lusty, robust (*Dryden*)

**ATHLONE**, a town of Westmeath, in Ireland Lat 53 22 N Lon 7 41 W

**ATHLOTHEIA**, in antiquity, an officer who superintended the public games

**ATHNACH**, the name of one of the principal of the Hebrew accents, which serves not only to regulate the voice, but to distinguish the numbers of a sentence, whence its name *athnach*, i. e. respiratio

**ATHOL**, a subdivision of Perthshire, in Scotland, containing some fine lakes

**ATHOS** mount Athos, situate between Macedonia and Thrace. Xerxes cut a way through it to make a passage for his army, when he went into Greece. Lucian relates that the architect Dinocrates, who was in the army of Alexander, offered him to cut mount Athos into the shape of a man, who should hold in his left hand a great city, and in his right hand a cistern which should receive the waters of all the rivers which fell from that mountain, and to convey them into the sea.

Alexander commended his curious design, but did not allow of the place, because there were no fields about the city to furnish the inhabitants with corn for their subsistence. Athos is situated in lat 40 10 N Lon 24 45 E

**ATHWART**, in navigation, is synonymous with across the line of the course. Athwart the fore foot, is a phrase that denotes the flight of a cannon-ball from one ship across the course of another, to intercept the latter, and oblige her to shorten sail, that the former may come near enough to examine her. Athwart-house, expresses the situation of a ship, when she is driven by wind or tide, or any other accident, across the fore part of another. Athwart-ships, reaching across ships from one side to the other.

**ATHWART** *ad* 1 In a manner vexatious and perplexing (*Shakspere*) 2 Wrong (*Shakspere*)

**ATL** *ad* (from *a* and *tith*) 1 In the manner of a titler, with the action of a man thrust (*Hudibras*) 2 In the pos-

ture of a barrel raised or tilted behind, to make it run out (*Spectator*)

**ATLANTIC OCEAN**, takes its name from mount Atlas, in Africa, and lies between the continents of Africa and Europe, and the continent of America. Its least breadth, from Guinea, in Africa, to Brasil in S America, is 2300 miles.

**ATLANTIADES**, a patronymic of Mercury, as grandson of Atlas. *Ovid*

**ATLANTIDES**, a people of Africa, near mount Atlas. The daughters of Atlas, seven in number, Maia, Electra, Taygeta, Asterope, Merope, Aleyone, and Calano. They married some of the gods and most illustrious heroes, and their children were founders of many nations and cities. The Atlantides were called nymphs, and even goddesses on account of their great intelligence and knowledge. The name of Hesperides was also given them, on account of their mother Hesperis. They were made constellations after death. See **PLEIADES**.

**ATLANTIS**, in antiquity, an island spoken of by Plato and many other writers under some extraordinary circumstances, and rendered famous by a controversy among the moderns, concerning its place and existence. The most distinct account of this country is given in Plato's *Timæus* and *Critias*.

**ATLANTIS** (New), is the name of a fictitious philosophical commonwealth, of which a description has been given by lord Bacon. Its chief design is to exhibit a model of a college, instituted for the interpretation of nature and the production of great and marvellous works, for the benefit of men under the name of Solomon's House, or, "the college of the six days work." Thus much, at least is finished and with great beauty and magnificence. The author proposed also a frame of laws, or of the best state or mould of a commonwealth. But this part is not executed.

**ATLAS**, in fabulous history, one of the Titans, son of Japetus and Clymene. He was brother to Epimetheus, Prometheus and Menæceus. He married Pleione, daughter of Oceanus, or Hesperis, according to others, by whom he had seven daughters, called Atlantides (see **ATLANTIDES**). He was king of Mauritania, and master of a thousand flocks of every kind, as also of beautiful gardens, abounding in every species of fruit, which he had entrusted to the care of a dragon. Perseus, after the conquest of the Gorgone, passed by the palace of Atlas, and demanded hospitality. The king, who was informed by an oracle of Themis that he should be dethroned by one of the descendants of Jupiter, refused to receive him, and even offered him violence. Perseus, who was unequal in strength, shewed him Medusa's head, and Atlas was instantly changed into a large mountain, which runs across the deserts of Africa east to west, and is so high that the ancients imagined that the heavens rested on its top, and that Atlas supported the world on his shoulders. The fable that Atlas supported the heavens on his back, arises from his fondness for astronomy, and his often frequenting

elevated places and mountains, whence he might observe the heavenly bodies

**ATLAS** (Great and Little), mountains of Africa the Great Atlas extends from the desert of Barca, about eighty leagues west of Alexandria to the coast of the Atlantic sea, to which it gives name, but often changes its name, according to the multitude of countries it runs through, and the plains and valleys by which it is intersected, it is called by the natives Ayduacal The Little Atlas extends from the Straits of Gibraltar to Bona in the country of Algiers, and is called by the natives Erriff Both these are of such vast height, and for the most part covered with snow, as to be seen at a great distance off at sea The highest parts and most difficult of access are those which run along the confines of the kingdom of Tremecen, and the coldest those that bound the dominions of Morocco

**ATLAS**, also denotes a book of universal geography, containing maps of the known parts of the world

**ATLAS** (*Atlas, ατλας*, from *ατλανω*, to sustain, because it sustains the head, or from the fable of Atlas, who was supposed to support the world upon his shoulders.) The name of the first cervical vertebra This vertebra differs very much from the others (see **VERTÈBRE**) It has no spinous process which would prevent the neck from being bent backwards, but in its place it has a small eminence The great foramen of this is much larger than that of any other vertebra Its body which is small and thin, is nevertheless firm and hard It is somewhat like a ring, and is distinguished into its great arch, which serves in the place of its body, and its small posterior arch The atlas is joined superiorly to the head by ginglymus, and inferiorly to the second cervical vertebra by means of the inferior oblique processes, and the odontoid process by trochloides

**ATLAS**, in commerce, a silk-satin, manufactured in the East Indies There are some plain, some striped, and some flowered, the flowers of which are either gold or only silk The manufacture of them is admirable, the gold and silk being worked together after such a manner as no workmen in Europe can imitate, yet they are very far from having that fine gloss and lustre which the French know how to give to their silk stuffs

**ATMOSPHERE** (*atmosfera*, from *ατμος*, vapour, and *σφαίρα*, a sphere) The gaseous or aeriform fluid which everywhere invests the surface of the terraqueous globe, and probably that of the other planets

The same word also denotes the sphere of the aroma of a plant, or of the infection of a contagious body

The terrestrial atmosphere imports the whole of the fluid mass, consisting of air, aqueous and other vapours, electric fluids, &c which surrounds the earth to a considerable height, and partakes of all its motions, both annual and diurnal

The atmosphere is a vast laboratory in which nature continually performs numberless pro-

cesses of analysis, solution, precipitation, and combination It is an immense recipient, in which all the attenuated and volatilized productions of terrestrial bodies are received, agitated, mingled, combined, or separated Considered in this view, the atmospheric air is a chaos, an indeterminate mixture of mineral vapours, vegetable and animal molecules, seeds, and eggs, through which the luminous, the caloric, and the electric fluids incessantly pass and re-pass in all directions

There is one substance, namely, the electrical fluid, which is very distinguishable in the mass of the atmosphere To measure the absolute quantity of this fluid, either in the atmosphere or any other substance, is perhaps impossible and nearly all that we know on this subject is, that the electric fluid pervades the atmosphere, that it appears to be more abundant in the superior than the inferior regions, that it seems to be the immediate bond of connection between the atmosphere and the water which is suspended in it, and that by its various operations, the phenomena of hail, rain, snow, lightning, and the other kinds of meteors are chiefly occasioned On this subject we would refer the inquisitive reader to a paper by Mr Frman, entitled Observations and Doubts concerning atmospheric Electricity, in Nos 40 and 41 of Nicholson's Journal, N 5

**Composition and Chemical Properties** It has been already observed under the article **AIR**, that the atmosphere contains, beside azotic and oxygen gas of which it is principally composed, a small portion of carbonic acid gas, and a variety of other substances diffused in different parts of it These are the exhalations which are continually taking place from all kinds of bodies, but especially the aqueous vapour which is unceasingly furnished by evaporation, by which means innumerable multitudes of minute and invisible particles, both dry and humid, are dispersed in all directions, and floating in the atmosphere, mix with the aeriform fluids which are essential to its constitution

Whether the fluids last mentioned, of which the gaseous part of the atmosphere consists, are only mechanically mixed, or are chemically combined so as by their combination to form one fluid or gas, is a question that does not appear to be decided In the early part of the enquiry, the former opinion seems to have prevailed The celebrated Scheele, however, doubted its truth, and contended for the chemical union of the gases His opinion has been strengthened by some subsequent discoveries, and has been adopted by philosophers in general The opposite opinion has been recently revived by Mr John Dalton, of Manchester, who, in his *Essay on the Constitution of mixed Gases*, &c inserted in the 5th volume of the *Manchester Memoirs*, has shewn himself an able advocate Mr John Gough controverts the opinion of Mr Dalton, and believes that the gases forming the atmosphere exist in the state of chemical mixture and not

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of mechanical mixture, and that uncombined elastic vapour is not mixed with the atmosphere. But in proof of the air being the result of a chemical combination of the gases, Dr Thompson, among others, adduces the circumstances of the constancy and exactness of the proportions of the nitrogen and oxygen in air,—the difference between air and the artificial mixture of the gases—the latter supporting flame and animal life longer, and flame even better than air itself.

Whether the proportions of gases in atmospheric air, at different heights, vary so considerably as 5 or 6 per cent as some have affirmed, or whether the difference be so small as to be with difficulty estimated, is a point upon which philosophers do not yet agree. That some difference exists is allowed by many, and several experiments seem to evince that the proportion of oxygen gas is less in greater altitudes, but that at ordinary altitudes the difference is so small as to be scarcely if at all perceptible. See AIR.

"In analysing the atmosphere in different places," says Mr Davy, "I have never been able to ascertain any notable difference in the proportions of its constituent parts." After noticing the similarity of results obtained from air collected on the sea at the mouth of the Severn, having passed over much of the Atlantic, at Guinea, at London and Kensington, at Paris, in Egypt, and Spain, Mr Davy adds, "we shall find strong reasons for concluding that the atmosphere, in all places exposed to the influence of the winds, contains very nearly the same proportions of oxygen and nitrogen (azot), a circumstance of great importance, for by teaching us that the different degrees of salubrity of air do not depend upon differences in the quantities of its chief constituent parts, it ought to induce us to institute researches concerning the different substances capable of being dissolved or suspended in the air, which are noxious to the human constitution, particularly as an accurate knowledge of their nature and properties would probably enable us, in a great measure, to guard against, or destroy, their baneful effects." *Journal of the Royal Institution*, vol. 1.

On the state of vapour subsisting in the atmosphere, Mr Kirwan has an elaborate paper in the *Irish Transactions*, vol. viii. in which he begins by stating that vapour or moisture may subsist not only in dense air, but in air highly rarefied, and, towards the conclusion, makes the following remarks:—"As vapours unite to air, partly through the agency of heat, and partly through that of affinity and of electricity, so they separate from it sometimes from a diminution of that degree of heat which they possessed in their nascent state, sometimes from a diminution of affinity, and sometimes from an alteration in their electrical state." "In their first degree of coalescence when separated from air, they form aggregates of exceedingly minute particles, separated from air by the diminution of affinity, and also from each other by electrical atmo-

spheres, these aggregates are of equal, and often lower, specific gravity, than the air in which they are formed, and yet are visible by reason of their opacity, when near the earth they are called fogs, mists, or haze (which differ only in density), and when at greater heights, clouds."

Clement and Desormes, on desiccating atmospheric air, found that a cubic foot of it would deposit 5.89 grains of water. *Ann. de Chemie*, No. 125.

The Uses of the Atmosphere are so many and great, that it seems indeed absolutely necessary, not only to the comfort and convenience of man, but even to the existence of all animal and vegetable life, and to the very constitution of all kinds of matter whatever, and without which they would not be what they are for by insinuating itself into all the vacancies of bodies, it becomes the great spring of most of the mutations here below, as generation, corruption, dissolution, &c. and without which none of these operations could be carried on. By the mechanical force of the atmosphere too, as well as its chemical properties, many important purposes are answered. We employ it in giving motion and direction to ships, turning mills, and other similar uses, and it is one of the great discoveries of the modern philosophers, that the several motions attributed by the ancients to a *fuga vacui* are really owing to the pressure of the atmosphere.

*Salubrity of the Atmosphere.* On the top of mountains the air is generally more salubrious than in pits or very deep places. Indeed, dense air is always more proper for respiration, as to the mere quality of density only, than that which is rarer. But then the air on mountains, though rarer, is freer from phlogistic vapours than that of pits, and hence it has been found that people can live very well on the tops of mountains, even when the air is but about half the density of that below. But it would seem that at some intermediate height between the two extremes, the air is the most salubrious and proper for animal life, and this height, according to M. Sussure, is about 500 or 600 yards above the level of the sea.

Besides the changes arising from the mere difference of altitude, the salubrity of the atmosphere is greatly affected by many other circumstances. The air, when confined, or stagnant, is commonly more impure than when agitated and shifted; thus, all close places are unhealthy, and even the air in a bedchamber is less salubrious in a morning, after it has been slept in, than in the evening. The abbé Fontana, from the result of accurate experiments, asserts, "that the difference between the air of one country and that of another, at different times, is much less than what is commonly believed, and yet that this difference in the purity of the air at different times, is much greater than the difference between the air of the different places observed by him." Finally, M. Fontana concludes in these words: "Nature is not so partial as we

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commonly believe. She has not only given us in air almost equally good every where at every time, but has allowed us a certain latitude, or a power of living and being in health in quantities of air which differ to a certain degree. By this I do not mean to deny the existence of certain kinds of noxious air in some particular places, but only say, that in general the air is good every where and that the small differences are not to be feared so much as some people would make us believe.

*Figure of the Atmosphere.* As the atmosphere envelops all parts of the surface of our globe, if they both continued at rest, and were not endowed with a diurnal motion about their common axis, then the atmosphere would be exactly globular, according to the laws of gravity, for all the parts of the surface of a fluid in a state of rest, must be equally removed from its centre. But as the earth and the ambient parts of the atmosphere revolve uniformly together about their axis, the different parts of both have a centrifugal force, the tendency of which is more considerable, and that of the centripetal less, as the parts are more remote from the axis, and hence the figure of the atmosphere must become an oblate spheroid, since the parts that correspond to the equator are further removed from the axis, than the parts which correspond to the poles. Besides, the heat of the atmosphere must, on another account, represent a flattened spheroid, namely because the sun strikes more directly the air which encompasses the equator, and is comprehended between the two tropics, than that which pertains to the polar regions; for, from hence it follows, that the mass of air, or part of the atmosphere, adjoining to the poles, being less heated, cannot expand so much, nor reach so high. And yet, notwithstanding, as the same force which contributes to elevate the air, diminishes its gravity and pressure on the surface of the earth, higher columns of it about the equatorial parts, all other circumstances being the same, may not be heavier than those about the poles.

*Height or Pressure of the Atmosphere.*—It is evident that the mass of the atmosphere, in common with all other matter, must be endowed with weight and pressure, and this principle was asserted by almost all philosophers, both ancient and modern. But it was only by means of the experiments made with pumps and the barometrical tube, by Galileo and Torricelli, that we came to the proof, not only that the atmosphere is endowed with a pressure, but also what the measure and quantity of that pressure is. Thus, it is found that the pressure of the atmosphere sustains a column of quicksilver, in the tube of the barometer, of about 30 inches in height, it therefore follows, that the whole pressure of the atmosphere is equal to the weight of a column of quicksilver, of an equal base, and 30 inches height and because a cubical inch of quicksilver is found to weigh nearly half a pound avoirdupois, therefore the whole 30 inches, or

the weight of the atmosphere on every square inch of surface, is equal to 15 pounds. Again, it has been found that the pressure of the atmosphere balances, in the case of pumps, &c. a column of water of about  $34\frac{1}{2}$  feet high, and, the cubical foot of water weighing just 1000 ounces, or  $62\frac{1}{2}$  pounds,  $34\frac{1}{2}$  times  $62\frac{1}{2}$ , or 2158lb will be the weight of the column of water, or of the atmosphere on a base of a square foot, and consequently the 144th part of this, or 15lb is the weight of the atmosphere on a square inch the same as before. Hence Mr. Collins computed that the pressure of this ambient fluid on the whole surface of the earth, is equivalent to that of a globe of lead of 60 miles in diameter. And hence also it appears, that the pressure upon the human body must be very considerable, for, admitting the surface of a man's body to be about fifteen square feet, and the pressure about 15lb on a square inch, he must sustain  $32,400$ lb or nearly 14½ tons weight for his ordinary load. And it might be easily shown that the difference in the weight of air sustained by our bodies in different states of the atmosphere, is often near a ton and a half.

Hence, it is so far from being a wonder, that we sometimes suffer in our health by a change of weather, that it is the greatest wonder we do not suffer oftener and more by such changes—for when we consider, that our bodies are sometimes pressed upon by near a ton and a half weight more than at another, and that the variation of the additional pressure of many pounds, is often very sudden, it is surprising that every such change does not entirely break the frame of our bodies to pieces. But the fact is, that our bodies always contain some elastic fluid, the spring of which is just sufficient to counterbalance the weight of the atmosphere.

One cause, however, either immediate or otherwise it seems, is the heat of the sun, for where this is uniform, the changes are small and regular; thus, between the tropics, it seems, the change depends on the heat of the sun, is the barometer constantly sinks about half an inch every day, and rises again to its former station in the night time. But in the temperate zones the barometer ranges from 28 to near 31 inches, shewing, by its various altitudes, the changes that are about to take place in the weather. If we could know, therefore, the causes by which the weather is influenced, we should also know those by which the gravity of the atmosphere is affected. These may perhaps be reduced to immediate ones, viz. an emission of latent heat from the vapour contained in the atmosphere, or of electric fluid from the same, or from the earth, as it is observed that they both produce the same effect with the solar heat in the tropical climates, viz. to rarefy the air, by mixing with it, or setting loose a lighter fluid, which did not before act in such large proportion in any particular place.

As to the alteration of heat and cold, Dr Darwin infers, that there is good reason to

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conclude that in all circumstances where air is mechanically expanded, it becomes capable of attracting the fluid matter of heat from other bodies in contact with it. Now, as the vast region of air which surrounds our globe is perpetually moving along its surface, climbing up the sides of mountains, and descending into the valleys, as it passes along it must be perpetually varying the degree of heat according to the elevation of the country it traverses for, in rising to the summits of mountains, it becomes expanded, having so much of the pressure of the superincumbent atmosphere taken away; and when thus expanded, it attracts or absorbs heat from the mountains in contiguity with it and, when it descends into the valleys and is compressed into less compass, it again gives out the heat it has acquired to the bodies it comes in contact with. The same thing must happen in the higher regions of the atmosphere, which are regions of perpetual frost, as has lately been discovered by the aerial navigators. When large districts of air, from the lower parts of the atmosphere, are raised two or three miles high, they become so much expanded by the great diminution of the pressure over them, and thence become so cold, that hail or snow is produced by the precipitation of the vapour and as there is, in these high regions of the atmosphere, nothing else for the expanded air to acquire heat from, after it has parted with its vapour, the same degree of cold continues till the air, on descending to the earth, acquires its former state of condensation and of warmth. The Andes, almost under the line, rests its base on burning sands about its middle height is a most pleasant and temperate climate covering an extensive plain, on which is built the city of Quito, while its forehead is encircled with eternal snow, perhaps coeval with the mountain. Yet, according to the accounts of don Ulloa, these three discordant climates seldom encroach much on each other's territories. The hot winds below, if they ascend, become cooled by their expansion, and hence they cannot affect the snow upon the summit and the cold winds that sweep the summit, become condensed as they descend, and of temperate warmth before they reach the fertile plains of Quito. See CLIMATE and TEMPERATURE.

### *Height and Density of the Atmosphere*

Various attempts have been made to ascertain the height to which the atmosphere is extended all round the earth. These commenced soon after it was discovered by means of the Torricellian tube, that air is endued with weight and pressure. And had not the air an elastic power, but were it every where of the same density, from the surface of the earth to the extreme limit of the atmosphere, like water, which is almost equally dense at all depths, it would be an easy matter to determine its height from its density and the column of mercury which it would counterbalance in the barometer tube. For, it having been observed that the weight of the atmosphere is equivalent to a column of 30 inches or two and a half

feet of quicksilver, and the density of the former to that of the latter, as 1 to 11040, therefore the height of the uniform atmosphere would be 11040 times two and a half feet; that is, 27600 feet, or little more than five miles and a quarter. But the air, by its elastic quality, expands and contracts, and it being found by repeated experiments in most nations of Europe, that the spaces it occupies, when compressed by different weights, are reciprocally proportional to those weights themselves, or, that the more the air is pressed, so much the less space it takes up, it follows that the air in the upper regions of the atmosphere must grow continually more and more rare, as it ascends higher, and indeed that, according to that law, it must necessarily be extended to an indefinite height. Now, if we suppose the height of the whole divided into innumerable equal parts, the quantity of each part will be as its density, and the weight of the whole incumbent atmosphere being also as its density, it follows, that the weight of the incumbent air is every where as the quantity contained in the subjacent part, which causes a difference between the weights of each two contiguous parts of air. But, by a theorem in arithmetic, when a magnitude is continually diminished by the like part of itself, and the remainders the same, these will be a series of continued quantities decreasing in geometrical progression. Therefore if, according to the supposition, the altitude of the air, by the addition of new parts into which it is divided, do continually increase in arithmetical progression, its density will be diminished, or, which is the same thing, its gravity decreased, in continued geometrical proportion. And hence, again, it appears that, according to the hypothesis of the density being always proportional to the compressing force, the height of the atmosphere must necessarily be extended indefinitely. And, farther, as an arithmetical series adapted to a geometrical one, is analogous to the logarithms of the said geometrical one, it follows therefore that the altitudes are proportional to the logarithms of the densities, or weights of air, and that any height taken from the earth's surface, which is the difference of two altitudes to the top of the atmosphere, is proportional to the difference of the logarithms of the two densities there, or to the logarithm of the ratio of those densities, or their corresponding compressing forces, as measured by the two heights of the barometer there. Thus, let  $D$  denote the density of the air at one place, and  $d$  the density at the other, both measured by the column of mercury in the barometrical tube: then the difference of altitude between the two places, will be proportional to the log of  $D$  — the log of  $d$ , or to the log of  $\frac{D}{d}$ . But as

this formula expresses only the relation between different altitudes, and not the absolute quantity of them, assume some indeterminate, but constant quantity  $h$ , which multiplying the expression  $\log \frac{D}{d}$ , may be equal to the real



# ATMOSPHERE

difference of altitude  $a$ , that is,  $a = h \times \log$  of

$\frac{D}{d}$  Then, to determine the value of the general quantity  $h$ , let us take a case in which we know the altitude  $a$  which corresponds to a known density  $d$ , as for instance, taking  $a = 1$  foot, or 1 inch, or some such small altitude: then because the density  $D$  may be measured by the pressure of the whole atmosphere, or the uniform column of 27600 feet, when the temperature is  $55^\circ$ , therefore 27600 feet will denote the density  $D$  at the lower place, and 27599 the less density  $d$  at 1 foot above it, consequently  $1 = h \times \log$  of  $\frac{27600}{27599}$ , which, by the nature of logarithms, is nearly  $= h \times \frac{4420448}{27600}$  or  $\frac{1}{63551}$  nearly, and hence we find  $h = 63551$  feet, which gives us this formula for any altitude  $a$  in general, viz  $a = 63551 \times \log$  of  $\frac{D}{d}$ , or  $a = 63551 \times \log$  of  $\frac{M}{m}$  feet,

or  $10592 \times \log$  of  $\frac{M}{m}$  fathoms, where  $M$  denotes the column of mercury in the tube at the lower place and  $m$  that at the upper. This formula is adapted to the mean temperature of the air  $55^\circ$  but it has been found, by the experiments of sir George Shuckburgh and general Roy, that for every degree of the thermometer, different from  $55^\circ$  deg the altitude  $a$  will vary by its 435th part, hence, if we would change the factor  $h$  from 10592 to 10090, because the difference  $592$  is the 18th part of the whole factor 10592, and because  $18$  is the 24th part of 435, therefore the change of temperature, answering to the change of the factor  $h$ , is  $24^\circ$ , which reduces the  $55^\circ$  to  $31^\circ$

So that,  $a = 10000 \times \log$  of  $\frac{M}{m}$  fathoms, is the truest expression for the altitude, and answers to the temperature of  $31^\circ$ , or very nearly the freezing point: and for every degree above that, the result must be increased by so many times its 435th part, and diminished when below it. See **BAROMETER**

From this theorem it follows, that, at the height of three and a half miles, the density of the atmosphere is nearly two times rarer than it is at the surface of the earth; at the height of seven miles, four times rarer, and so on, according to the following table

Height in Miles	Number of times rarer
3½	2
7	4
14	16
21	64
28	256
35	1024
42	4096
49	16384
56	65536
63	262144
70	1048576

And, by pursuing the calculations in this table, it might be easily shewn, that a cubic

inch of the air we breathe, would be so much rarefied at the height of 500 miles, that it would fill a sphere equal in diameter to the orbit of Saturn

According to the foregoing reasoning, the altitude of the atmosphere must be indefinite, or, as many would say, it terminates in pure æther. One principal effect, however, being the refraction of light, whose particles are the smallest of any we know of in nature, it is reasonable to fix the boundary of the atmosphere, in the altitude where it begins to have the effect of bending the rays of light. Now it was found by Kepler and De la Hire after him, who computed the height of the sensible atmosphere from the duration of twilight, and from the magnitude of the terrestrial shadow in lunar eclipses, that the effect of the atmosphere to reflect and intercept the light of the sun, is only sensible to the altitude of between 40 and 50 miles: and at that altitude we may collect, from what has been already said, that the air is above 10000 times rarer than at the surface of the earth. It is well known that the twilight begins and ends when the centre of the sun is about  $16^\circ$  below the horizon, or only  $17^\circ 27'$ , by subtracting  $33'$  for refraction which raises the sun so much higher than he would be. And a ray coming from the sun in that position, and entering the earth's atmosphere, is refracted and bent into a curve line in passing through it to the eye. This curve De la Hire thought to be a cycloid, but Herman shewed that the curve is infinitely extended, and has an asymptote, and, according to Brook Taylor, the curve is one of the most intricate and perplexing that can well be proposed. But the rays may be reflected as well as refracted, and if we suppose them to come to the spectator after one reflection the height at which the rays are reflected is found to be about 39 64 miles, while the height at which they are refracted is about 77½ miles. On the supposition of two or more reflections, the altitude will be much decreased: but after all, the determination of Kepler and De la Hire is as probable as any. See **REFRACTION** and **TWILIGHT**

*Refractive and reflective Power of the Atmosphere* It has been observed, that the atmosphere has a refractive power, by which the rays of light are bent from the right line direction, as in the case of twilight, and many other experiments manifest the same virtue, which is the cause of many phenomena. The atmosphere, or air, has also a reflective power, and this power is the means by which objects are enlightened so uniformly on all sides. The want of this power would occasion a strange alteration in the appearance of things, the shadows of which would be so very dark, and their sides enlightened by the sun so very bright, that probably we could see no more of them than their bright halves; so that for a view of the other halves, we must turn them half round, or, if immovable, must wait till the sun could come round upon them. Such a pellucid unreflective atmosphere would in-



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deed have been very commodious for astronomical observations on the course of the sun and planets among the fixed stars, visible by day as well as by night, but then such a sudden transition from darkness to light, and from light to darkness, immediately upon the rising and setting of the sun, without any twilight, and even upon turning to or from the sun at noon day, would have been very inconvenient and offensive to our eyes See Keill's Astron Lect 20

**ATMOSPHERES OF THE PLANETS** Since the planets and their satellites, are now universally allowed to be bodies of a nature similar to the earth we inhabit, there are few, it any, philosophers of the present day who attempt to deny that the planets are surrounded with atmospheres analogous in most respects to that whose properties have been explained in the preceding articles M de la Place in his *Système du Monde* enters into a considerable detail respecting the atmospheres of the planets "In all the changes to which the atmosphere is subject," says he, vol ii p 126 "the sum of the products of the particles of the revolving body, and its atmosphere, multiplied respectively by the areas they describe round the common centre of gravity, the radii being projected on the plane of the equator remain the same in equal times Supposing, therefore, that by any cause whatever, the atmosphere should be contracted, or that part thereof should become condensed on the surface of the body, the rotatory motion of the body and its atmosphere would be accelerated for, the radii vectores of the areas described by the particles of the original atmosphere becoming smaller, the sum of the products of all the particles, by their corresponding areas, cannot remain the same unless the velocity be augmented The atmosphere is flattened towards the poles, and swelled out at the equator But this oblateness has its limits and in the case where it is greatest, the ratio of the polar and equatorial diameter is as 2 to 3 The atmosphere cannot extend itself at the equator to a greater distance than to the place where the centrifugal force is exactly equal to the force of gravity With regard to the sun, this point is remote from its centre to a distance measuring the radius of the orbit of a planet which would make its revolution in the same period as that luminary employs in its rotation The solar atmosphere cannot, therefore, extend to the orbit of Mercury, and consequently it cannot produce the zodiacal light, which appears to extend even to the orbit of the earth

**ATMOSPHERE (Lunar)** See MOON

**ATMOSPHERE**, in electricity, denotes according to some, that medium which is conceived to be diffused over the surface of electrified bodies, and to some distance around them, and consisting of effluvia issuing from them, by which, other bodies immersed in it become charged with an electricity contrary to that of the body to which the atmosphere belongs

By atmosphere, M Lippius says, no more is to be understood than the sphere of action

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belonging to any body, or the neighbouring air electrified by it Sig Beccaria agrees in the same opinion, that electrified bodies have no other atmosphere than the electricity communicated to the neighbouring air, and which goes with the air, and not with the electrified bodies Mr Canton also, having relinquished the opinion that electrical atmospheres were composed of effluvia from excited or electrified bodies, maintained that they only result from an alteration in the state of the electric fluid contained in it, or belonging to the air surrounding these bodies to a certain distance

**ATMOSPHERICA** *a* (from *atmo* sphere, *τὸ ατμοσφαιρικόν*) Belonging to the atmosphere

**ATMOSPHERICAL LOGARITHMIC** See LOGARITHMIC

**ATMOSPHERIC TIDES**, certain periodical changes in the atmosphere similar in some respects to those of the sea, and produced in great measure by the same causes

There are two kinds of motion in the atmosphere, which come under this denomination: the first is occasioned by the joint influence of the sun and moon upon the body of air with which we are surrounded, in the same manner as they act upon the mass of water, and cause the flux and reflux of the ocean, the second is produced by the heat of the sun alone, which exerting upon the air its well known power of rarefaction and expansion, gives rise to those perpetual changes in the atmosphere which follow him in his course, although such changes are not altogether observable or applicable by us The former of these are termed by the abbe Mann, attraction tides, and the latter heat-tides The tides of attraction like those of the ocean, and from the like grounds have at the same time at two opposite ends of the globe, projecting parts, and these lie almost in that line which might be drawn from the centre of the earth to that of the moon The heat tides, on the other hand, can take place only on one point of the globe, that is, in the point to which the sun is vertical Their projecting part will be directed towards that luminary, and nearly follows its movements

Bacon, and the most eminent authors who have since his time written on the wind, unanimously observe, that the periods of the year most exposed to it are the two equinoxes, that storms are most frequent at the times of new and full moon, and particularly those which happen near the equinoxes, that at periods otherwise calm, a small breeze always takes place at high water, and that a small movement in the atmosphere is each time perceived a little after noon and midnight

For the investigation of this subject, the abbe lays down the following principles 1 The elasticity of fluids is in the inverse ratio of their density 2 The force or elasticity of the air expands and contracts itself in the direct ratio of the weight with which it is loaded, and diffuses itself in the inverse ratio of the force by which it is compressed 3 The air

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is rarefied, or diffuses itself, in the direct ratio of the quantity of heat which acts upon it 4 The air, as well as all fluids in general, has a tendency to put itself in equilibrium, and does not rest until it has obtained it

It is impossible, within our limits, to follow the abbe in the application of these principles to the various phenomena of the subject in question, we therefore recommend to the attention of our readers the whole of his Observations on the Flux and Reflux of the Atmosphere, inscribed, from the Brussels Transactions, in *Lillochs' Philosophical Magazine*, vol 1 In the VIIth volume of that work is a paper On a periodical Variation of the Barometer &c by Luke Howard, esq to which we also refer, and conclude by noticing the observations made by Humboldt, near the equator "I have read," says he, "in the Transactions of the Bengal Society, that the barometer rises and falls there regularly every twenty four hours Here in South America, its motion is more astonishing there are four atmospherical tides every twenty four hours, which depend only on the attraction of the sun, the mercury falls from nine o'clock in the morning till four in the evening, it rises from four till eleven o'clock, it falls from eleven till half past four in the morning, and reascends from that time till nine o'clock neither winds, storms, nor earthquakes have any influence on this motion See farther, Laplace, *Traité de Mécanique*, liv 11 ch 12

ATMOSPHERIC STONES See AEROLITHS

ATOM *s* (*atomus*, Latin) 1 Such a small particle as cannot be physically divided (*Ran*) 2 Any thing extremely small (*Shakspeare*)

ATOMIC *a* (from *atom*) 1 Consisting of atoms (*Brown*) 2 Relating to atoms (*Bentley*)

ATOMIC PHILOSOPHY, the doctrine of atoms, a system which, from the hypothesis that atoms are endued with gravity and motion accounted for the origin and formation of things This philosophy was first broached by Moschus, some time before the Trojan war, but was much cultivated and improved by Epicurus, whence it is denominated the Epicurean philosophy.

ATOMIST *s* (from *atom*) One that holds the atomical philosophy (*Locke*)

ATOMY *s* An atom obsolete (*Shakspeare*)

10 ATONE *v* 1 (from *at one*) 1 To agree, to accord (*Shakspeare*) 2 To stand as an equivalent for (*Locke*)

10 ATONE *v* 1 To reduce to concord (*Drummond*) 2 To expiate, to answer for (*Pope*)

ATONEMENT *s* (from *atone*) 1 Agreement, concord (*Shakspeare*) 2 Expiation, expiatory equivalent (*Swift*)

ATONEMENT, is the averting the punishment due to any one, and which God might

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justly inflict, by undergoing the penalty in the room of the guilty (*Rom* v. 1), and this is also called propitiation (*Rom* iii 25 1 John ii 2)

The definition of Dr Doddridge (*Works*, vol v p 211) is this —Whatever that is, which being done or suffered either by an offending creature himself, or by another for him, shall secure the honours of the divine government in bestowing upon the offender pardon and happiness, may properly be called a satisfaction or atonement made to God for him After this definition he shews, that Christ has made satisfaction for the sins of all those who repent of their sins, and return to God in the way of sincere, though imperfect obedience See also Wutt's Redeemer and Sanctifier (*Works*, vol iii p 742) The Arminian scheme of atonement is explained in Dr Clark's Sermons, vol viii p 366, and Dr John Taylor's singular hypothesis, in his Scripture Doctrine of Atonement examined, and his Key to the Apostolic Writings

ATONIC Relaxation, diminution of strength, weakness, debility It should imply total loss or destitution of tone, but generally expresses mere diminution hypotonic

ATONY (*atonia*, *ατυνα*, from *a neg* and *τύνω*, to extend) A defect of muscular power

ATOOI, one of the Sandwich islands, discovered by captain Cook in his last voyage This island is about 10 leagues in length, and affords a supply of fish and fowl sufficient for its inhabitants, the number of whom it is supposed amounts to about 30,000 The natives are cannibals, for captain Cook had sufficient proof of their eating the flesh of their enemies Lat 21 57 N Lon 159 40 W

ATOP *ad* (from *a* and *top*) On the top, at the top (*Milton*)

ATRABILARIÆ CAPSULÆ See CAPSULÆ

ATRABILARIAN ATRABILIARIOUS *a* (from *atra* and *bilis*, Lat) Melancholy, replete with black choler (*Arluthnot*)

ATRABILARIOUSNESS *s* (from *atrabilarius*) The state of being melancholy

ATRABILIARY (from *ater*, black, and *bilis*, the bile) Of a melancholy or hypochondric habit, from an old opinion that such habit was produced by the secretion of high or dark-coloured bile

ATRA BILIS, in ancient medicine, the black bile one of the humours of the ancient physicians, which the moderns call melancholy Dr Perceval suggests that this disorder is occasioned by the stagnation of the gall, by which it is rendered too viscid by the absorption of its fluid parts Bile in this state discharged into the duodenum occasions universal disturbance until it is evacuated It brings on vomiting, purging, &c previous to which are fever, delirium &c

ATRACTYLIS Distaff thistle In botany, a genus of the class and order syngenesia polygamia æqualis Receptacle chaffy, down feathery, calyx unbricate, invested with scales,

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corol radiate, corolllets of the ray five-toothed/ Two species a. humilis of Spain A flava of Barbary

**ATRACTOBOLUS** In botany, a genus of the class and order cryptogamia fungi. Fungus sessile, cupular, with a lid, ejecting fusiform vesicles bearing the seeds One species only

**ATRA DIES**, in antiquity, denotes a fatal day whereon the Romans received some memorable defeat The word literally imports a black day; a denomination taken from the colour which is the emblem of death and mourning.

**ATRA'GENE** In botany, a genus of the class and order polyandria polygynia Calyx- less, corol double, petals numerous, the outer ones larger, seeds tailed Six species, widely dispersed over the globe, but all exotic to ourselves

**ATRAMENTAL** **ATRA'MENTOUS** *a* (from *atramentum*, ink Lat) Inky, black (Brown)

**ATRAMENTARIOUS STONES**, a name applied to various minerals and neutral salts, of which iron is a component part, and which on that account are adapted to the making of ink

**ATRAPHA'XIS** In botany, a genus of the class and order hexandria digynia Calyx two leaved; petals two, sinuate, stigmas capitate, seed one Two species, Armenia and the Cape

**ATREBATHI**, one of those Belgic colonies which came out of Gaul into Britain, and there retained their ancient name They originally inhabited the country which is now called Artois, and are mentioned by Caesar among the nations which composed the Belgic confederacy against him

**ATRE'SIA** (from *a neg* and *τρεψω*, to perforate) An imperforate anus, urethra, or vagina

**ATRE'TOUS** (from *atresia*) Imperforate

**ATREUS**, in fabulous history, the son of Pelops and Hippodamia, and the father of Agamemnon and Menelaus, is supposed to have been king of Mycenae and Argos about 1228 years before the Christian era He drove his brother Thyestes from court, for having a criminal commerce with Ærope his wife but understanding that he had had two children by her, he sent for him again, and made him eat them, at which horrid action, the sun, it is said, withdrew his light

**ATRIENSIS**, in antiquity, a kind of upper servants or house-stewards, who had the management of the other servants, and the chief care and inspection of the furniture and valuables These had assistants, called atriarii

**ATRIP**, in nautical language, is applied either to the anchor or sails The anchor is atrip, when it is drawn out of the ground in a perpendicular direction, either by the cable or buoy-rope The top-sails are atrip, when they are hoisted up to the mast-head, or to their utmost extent

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**ATRI'PLEX** Orach, or sea-purslane: a genus of the class and order polygamia monoe-cia. Herm: calyx five parted inferior, corolless; style two parted, seed one, compressed Sixteen species scattered over Europe, Asia, and Africa of which seven are natives of our own country:

A portulacoides,	} found in salt marshes
A pedunculata,	
A littoralis,	
A patula,	} in wastes and commons
A angustifolia,	
A erecta,	
A laciniata, on the sea-sands	

**ATRI'PLEX FETIDA** *Atriplex olida* Vulvaria This plant is the chenopodium vulvarii, foliis integerrimis rhombic ovatis, floribus conglomeratis axillaribus of Linnaeus, and its very fetid smell induced physicians to exhibit it in hysterical diseases It is now superseded by more active preparations

**ATRI'PLEX HORTENSIS** The Linnean name for the atriplex striva of the pharmacopœia See **ATRI'PLEX SATIVA**

**ATRI'PLEX SATIVA** The herb and seed of this plant atriplex hortensis caule erecto herbaceo, foliis triangularibus of Linnaeus, have been exhibited medicinally, but the practice of the present day appears to have totally rejected them

**ATRIUM**, in ecclesiastical antiquity, denotes an open place or court before a church, making part of what was called the narthex or ante-temple The atrium in the ancient churches was a large area or square plot of ground, surrounded with a portico or cloister, situate between the porch or vestibule of the church and the body of the church

**ATRIUM**, is used in the canon law for the cemetery, or church-yard

**ATRO'CIOUS** *a* (*atrox*, Lat) Wicked in a high degree, enormous (*Ayiffi*)

**ATRO'CIOUSLY** *ad* (from *atrocious*) In an atrocious manner, with great wickedness

**ATRO'CIOUSNESS** *s* (from *atrocious*) The quality of being enormously criminal

**ATRO'CITY** *s* (*atrocitas*, Latin) Horrible wickedness (*Wotton*)

**ATRO'PA** Deadly night-shade a genus of the class and order pentandria monogynia Corol campanulate, stamens distant, berry superior, globular, two-celled Seven species, mostly of warm climates The two chiefly noticed are

A mandragora **MANDRAKE**, which see  
A belladonna **DWALE** See **BELLADONNA**

**ATRO'PHY** (*atropia*, *ατρωια*, from *a neg* and *τρεψω*, to nourish) Emaciation and weakness, but without hectic fever This disease is arranged by Cullen in the class cachexia, and order marcores When it takes place from too copious evacuations, it is termed atrophia inanitorum, when from famine, atrophia famelicorum, when from corrupted nutriment, atrophia cacochymica, and when from an in-

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terraption in the digestive organs, atrophis debiliun

A PROPOS, one of the Parcs, daughters of Nox and Erebus According to the derivation of her name *απροπος*, *immutabilis*, she is inexorable, and inflexible, and her duty among the three sisters is to cut the thread of life without any regard to sex, age, or quality

To ATTA'CH *v a* (attacher, Fr) 1 To arrest, to take or apprehend (*Cowell*) 2 To seize (*Shakspeare*) 3 To lay hold on (*Shakspeare*) 4 To win, to gain over, to enamour (*Milton*) 5 To fix to one's interest (*Rogers*)

ATTACHMENT *s* (attachement, Fr) 1 Adherence, fidelity (*Addison*) 2 Attention, regard (*Arluthnot*)

ATTACHMENT, in law, the taking or apprehending a person or thing, either by commandment, or writ The word is formed of the French *attacher*, to fasten, tie, and that from the corrupt Latin *attachiare*, of *attexere*, to weave to, or rather, as others think, from the Celtic *tach*, a nail, and *tacha*, to nail, or the Saxon *tacan*, to take Lambard makes this difference between an arrest and an attachment, that an arrest proceeds out of an inferior court by precept only, and an attachment out of a higher court, either by precept, or writ, and that a precept to arrest hath these formal words, *duci facias*, &c and a writ of attachment these, *præcipimus tibi quod attaches talem, et habeas eum coram nobis* By this it appears, that he who arrests carries the party arrested to another higher person, to be disposed of forthwith, whereas he that attaches keeps the party attached, and presents him in court at the day assigned in the attachment There is this farther difference, that an arrest lies only upon the body of a man, and an attachment sometimes on his goods too

*Attachment by Writ* differs from distress in this, that an attachment does not reach lands, as a distress does, and that a distress does not touch the body, which an attachment does Yet the two are frequently confounded together

*Attachment out of the Chancery* is had of course, upon an affidavit it made that the defendant was served with a subpoena, and appears not, or it issueth upon not performing some order or decree

*Attachment of Privilege*, is by virtue of a man's privilege, to call another to that court whereto he himself belongs, and in respect whereof he is privileged to answer some action

*Attachment (Foreign)*, is an attachment of goods or money found within a liberty or city, to satisfy some creditor within such city or liberty

*Attachment out of the Forest*, is one of the three courts held in the forest The lowest court is called the court of attachment, or wood-mote court, the mean, swan mote, and the highest, the justice in eyre's seat

This attachment is by three means, by goods and chattels, by body, pledges, and mainprize,

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or the body only This court is held every forty days throughout the year, whence it is called forty-days court

To ATTA'CK *v a* (attaquer, Fr) 1 To assault an enemy (*Philips*) 2 To impugn in any manner

ATTACK *s* (from the verb) An assault (*Pope*)

*Attack of a Siege*, is an effort made by the besiegers with trenches, mines, galleries, &c to make themselves masters of a fortress, in attacking one of its sides

It is a rule always to attack on the weakest side, unless there be superior reasons for the contrary, as was the case at the siege of Lisle in which the part where prince Eugene made his attack, was the strongest in the whole place

*Attack (False)*, is that which is not so vigorously prosecuted, serving only to make a diversion among the besieged, and to oblige them to divide their forces, that the true attack may be carried on with greater success

ATTACKER *s* (from attack) The person that attacks

ATTACOTTI, an ancient people of Britain, mentioned by St Jerome, as well as in the Notitia Imperii They are represented as allies of the Scots and Picts, and, therefore, were probably their neighbours though their precise situation has not been determined

To ATTA'IN *v a* (atteindre, French) 1 To gain, to procure (*Millotson*) 2 To overtake, to come up with (*Bacon*) 3 To come to, to enter upon (*Milton*) 4 To reach; to equal (*Bacon*)

To ATTA'IN *v n* 1 To come to a certain state (*Arluthnot*) 2 To arrive at (*Locke*)

ATTAIN *s* (from the verb) The thing attained not used (*Glanville*)

ATTAINABLE *a* (from attain) That may be attained, procurable (*Millotson*)

ATTAINABLENESS *s* (from attainable) The quality of being attainable (*Cheyne*)

ATTAINER (attincta and attinctura) The stain or corruption of the blood of a criminal capitally condemned, the immediate, inseparable consequence, by the common law, on pronouncing the sentence of death He is then called *attaint*, *attinctus*, stained, or blackened He is no longer of any credit or reputation, he cannot be a witness in any court, neither is he capable of performing the functions of another man for, by an anticipation of his punishment, he is already dead in law This is after judgment for there is great difference between a man convicted and attainted, though they are frequently through inaccuracy confounded together After conviction only, a man is liable to none of these disabilities for there is still in contemplation of law a possibility of his innocence Something may be offered in arrest of judgment the indictment may be erroneous, which will render his guilt uncertain, and thereupon the present conviction may be quashed he may obtain a pardon, or be allowed the benefit of

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clergy, both which suppose some latent sparks of merit, which plead in extenuation of his fault. But when judgment is once pronounced, both law and fact conspire to prove him completely guilty, and there is not the remotest possibility left of any thing to be said in his favour. Upon judgment, therefore, of death, and not before, the attainder of a criminal commences, or upon such circumstances as are equivalent to judgment of death, as judgment of outlawry on a capital crime, pronounced for absconding or fleeing from justice, which tacitly confesses the guilt, and therefore, upon judgment either of outlawry, or of death, for treason or felony, a man shall be said to be attainted.

A person attainted of high treason forfeits all his lands, tenements, and hereditaments, his blood is corrupted, and he and his posterity rendered base, and this corruption of blood cannot be taken off but by act of parliament.

Attainers may be reversed or falsified (i. e. proved to be false) by writ of error, or by plea. If by writ of error, it must be by the king's leave, &c. and when by plea, it may be by denying the treason, pleading a pardon by act of parliament, &c.

**ATTAINMENT** *s* (from *attain*) 1 That which is attained, acquisition (*Grew*) 2 The act or power of attaining (*Hooker*)

**To ATTAINT** *v a* (*attenter*, *Fr*) 1 To disgrace, to cloud with ignominy (*Spenser*) 2 To attain is particularly used for such as are found guilty of some crime or offence (*Spenser*) 3 To taint, to corrupt (*Shakspeare*)

**ATTAINTE** *c* (from the verb) 1 Any thing injurious (*Shakspeare*) 2 Stain, spot, taint (*Shakspeare*)

**ATTAINTE**, is a writ that lies after judgment against a jury of twelve men that have given false verdict in any court of record, in an action real or personal, where the debt or damages amount to above 40*s*. Stat 5 and 34 Ed III c 7. It is called attaint, because the party that obtains it endeavours thereby to stain or taint the credit of the jury with perjury, by whose verdict he is grieved.

The jury who are to try this false verdict must be twenty-four, and are called the grand jury; for the law will not that the oath of one jury of twelve men should be attained or set aside by an equal number, nor by less indeed than double the former. And he that brings the attaint can give no other evidence to the grand jury, than what was originally given to the petit. For as their verdict is now wrong, and the question is whether or no they did right upon the evidence that appeared to them, the law adjudged it the highest absurdity to produce any subsequent proof upon such trial, and to condemn the prior jurisdiction for not believing evidence which they never knew.

**ATTAINTE**, among farriers, a bruise or hurt on a horse's leg, proceeding either from a blow with another horse's foot, or from an over-exposure in frosty weather, when a horse, being

rough shod, or having shoes with long caulks, strikes his hinder foot against his fore-leg.

**ATTAINTURE** *s* (from *attaint*) Re-approach, imputation (*Shakspeare*)

**To ATTA'INARE** *v a* (*attamino*, *Lat*) To corrupt, to spoil.

**ITALICÆ VESTES**, in antiquity, garments made of a kind of cloth of gold.

**ATTALUS**, king of Pergamus, who it is said made the people of Rome heirs of his kingdom, and of all his wealth by will, which raised a great disturbance at Rome, and caused a war in Asia. For Tiberius Gracchus, tribune of the people, demanded that the goods of Attalus might be distributed among the people.

The senate opposed this demand, and ordered the consul to put Gracchus to death, which he refused to execute, but Scipio Nasica, chief priest of Jupiter, throwing his garment upon his head, said, they that love the good and preservation of the commonwealth, let them follow me, and going immediately up to the capitol, he was followed by the senators, who slew Gracchus and all his parties in their seats in the capitol. Antonius, who affirmed himself to be the son of Attalus, and in that quality thought to enjoy the estate, which the Romans claimed as heretics of the king, was an occasion of a second war in Asia.

**ATTF'LABIUS** In zoology, a genus of the class and order insecta coleoptera. Antennas moniliform, thicker towards the tip, seated on the snout, head pointed behind inclined. Fifty-nine species, generally inhabitants of the leaves of trees in different quarters of the globe. They may be thus subdivided.

A Jaw bifid feelers filiform.

B Jaw one-toothed, hind-feelers hatchet-shaped denominated elcru.

C Jaw conic, entire, feelers filiform. The Spondylis of Fabricius and others. We can only notice the following.

1 A coryli, black shells rufous reticulate. Found in the leaves of the nut tree, which it rolls into a cylinder closed at each end. The well-known of Linneus and Gmelin with red thio and legs is a more variety.

2 A Bachi. Purple with gold shades snout and end of the legs black. Inhabits Europe on the vine and nut tree.

3 A betule. Black legs formed for skipping. Found on the leaves of the birch-tree, the leaves of which it curls up in a very beautiful manner.

**To ATT'UMPER** *v a* (*attempero*, *Lat*) 1 To mingle, to weaken by the mixture of something else, to dilute (*Bacon*) 2 To soften, to mollify (*Baron*) 3 To mix in just proportions (*Spenser*) 4 To mix with something else (*Pope*)

**To ATTEM'PERARE** *v a* (*attempero*, *Lat*) To proportion to something (*Hum-mond*)

**To ATTF'MPT** *v a* (*attenter*, *Fr*) 1 To attack, to venture upon (*Milton*) 2 To try, to endeavour (*Macaulais*)

**ATTF'MPT** *s* (from the verb) 1 An at-

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tack (*Bacon*) 2 An essay, an endeavour (*Dryden*)

ATTIEMPTABLE *a* (from *attempt*) Liable to attempts or attacks (*Shakspeare*)

ATTIEMPTLR *s* (from *attempt*) 1 The person that attempts (*Milton*) 2 An endeavourer (*Glanville*)

To ATTEND *v a* (*attendre*, Fr) 1 To regard, to fix the mind upon (*Shakspeare*) 2 To wait on as a servant (*Shakspeare*) 3 To accompany as an enemy (*Clarendon*) 4 To be present with, upon a summons 5 To accompany, to be appendant to (*Arbuthnot*) 6 To wait on, as on a charge (*Spenser*) 7 To be consequent to (*Clarendon*) 8 To return to, to await (*Locke*) 9 To wait for insidiously (*Shakspeare*) 10 To be bent upon any object (*Dryden*) 11 To stay for (*Dryden*)

To ATTEND *v n* 1 To yield attention (*Faylor*) 2 To stay, to delay (*Davies*) 3 To wait, to be within call (*Spenser*)

ATTENDANCE *s* (*attendance*, Fr) 1 The act of waiting on another (*Shakspeare*) 2 Service (*Shakspeare*) 3 The persons waiting, a train (*Milton*) 4 Attention, regard (*Timothy*)

ATTENDANT *a* (*attendant*, Fr) Accompanying as subordinate, or consequential (*Milton*)

ATTENDANT *s* 1 One that attends (*Shakspeare*) 2 One that belongs to the train (*Dryden*) 3 One that waits as a suitor or agent (*Burns*) 4 One that is present at any thing 5 That which is united with another as a concomitant or consequent (*Hall*)

ATTENDIR *s* (from *attend*) Companion, associate (*Ben Jonson*)

ATTENT *a* (*attentus*, Lat) Intent, attentive, heedful, regardful (*Faylor*)

ATTENTATIFS (*attentatus*, Lat) Proceedings in a court of judicature after an inhibition is decreed (*Ayliffe*)

ATTENTION (from *ad*, to, and *tendo*, I stretch) A due application of the ear, the eye or the mind, to any thing said or done, in order to acquire a knowledge thereof Attention of mind is not properly an act of the understanding, but rather of the will, by which it calls the understanding from the consideration of other objects, and directs it to the thing in hand. Nevertheless, our attention is not always voluntary: an interesting object seizes and fixes it beyond the power of controul. According to the degree of attention, objects make a stronger or weaker impression. Attention is requisite even to the simple act of seeing the eye can take in a considerable field at one look, but no object in the field is seen distinctly, but that singly which fixes the attention in a profound reverie that totally occupies the attention we scarce see what is directly before us. In a train of perceptions, no particular object makes such a figure as it would do singly and apart, for when the attention is divided among many objects, no particular object is entitled to a large share. Hence, the stillness of night contributes to

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terror, there being nothing to divert the attention

Horror ubique animos, simul ipsa silentia terrent *Æneid*, 11

Zara Silence and solitude are every-where! Through all the gloomy ways and iron doors That hither lead, nor human face nor voice Is seen or heard A dreadful din was wont To grate the sense, when enter'd here, from groans

And howls of slaves condemn'd, from clink of chains,

And crash of rusty bars and creaking hinges, And ever and anon the sight was dash'd With frightful faces, and the meagre looks Of grim and ghastly executioners

Yet more this stillness terrifics my soul Than did that scene of complicated horrors

*Mourning Bride*, a b s 8

In matters of slight importance, attention is mostly directed by will, and for that reason, it is our own fault if trifling objects make any deep impression. Had we power equally to withhold our attention from matters of importance, we might be proof against any deep impression. But our power fails us here: an interesting object seizes and fixes the attention beyond the possibility of controul and while our attention is thus forcibly attached to one object, others may solicit for admittance, but in vain, for they will not be regarded. Thus a small misfortune is scarcely felt in presence of a greater

*Lear* Thou thin'st 'tis much, that this contentious turn

Involves us to the skin, so 'tis to thee, But where the greater malady is fix'd, The lesser is scarce felt Thou'dst shun a bear,

But if thy flight lay toward the roaring sea, Thou'dst meet the bear at the mouth When the mind's free,

The body's delicate the tempest in my mind Doth from my senses take all feeling else, Save what beats there

*King Lear*, a 3 s 5

ATTENTIVE *a* (from *attent*) Heedful, regardful, full of attention (*Hooker*)

ATTENTIVELY *ad* (from *attentive*) Heedfully, carefully (*Bacon*)

ATTENTIVENESS *s* (from *attentive*) Heedfulness, attention (*Shakspeare*)

ATTENUANI *a* (*attenuans*, Latin) That has the power of making thin, or diluting ATTENUANIS (*attenuantia* sc *medicamenta*, from *attenuo*, to make thin) Diluents Those substances are so termed, which possess a power of imparting to the blood a more thin and fluid consistence than it had previous to their exhibition, such are water, milk-whey, &c

To ATTENUATE *v a* (*attenuo*, Lat) To make thin, or slender (*Boyle*)

ATTENUATE *a* (from the verb) Made thin, or slender (*Bacon*)

ATTENUATE PEDUNCLE, or SCAPE In

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botany, tapered or tapering. Becoming gradually smaller towards the flower. Opposed to incrassated or thickening. Attenuate leaf, a leaf tapering towards one or both extremities.

**ATTENUATION** *s* (from *attenuate*) The act of making any thing thin or slender (*Bacon*).

**ATTÉR** *s* (atep, Sax venom) Corrupt matter (*Skinner*).

**ATTERBURY** (Francis), bishop of Rochester, was the son of Dr Lewis Atterbury, and was born at Middleton near Newport-Pagnel, in Buckinghamshire. He was educated at Westminster school, and in 1680 elected a student of Christ Church college, Oxford, where he soon distinguished himself by the elegance and vivacity of his wit and his fondness for polite learning. On his taking holy orders, he so distinguished himself by the elegance of his sermons, that he was appointed one of the chaplains in ordinary to king William and queen Mary. He exerted himself in the controversy with the papists, by writing an excellent defence of Luther, and engaged in several controversies, particularly with Dr Wake, in which he displayed so much learning, ingenuity, and zeal for the interest of his order, that the lower house of convocation returned him thanks, and the university of Oxford complimented him with the degree of doctor of divinity. Upon the accession of queen Anne in 1702, he was appointed one of her majesty's chaplains in ordinary; in 1704 he was advanced to the deanery of Carlisle, in 1707 he was appointed one of the canons residentiary of Exeter, in 1712 he was made dean of Christ Church, and the next year bishop of Rochester. During the rebellion in Scotland, in the first year of George the First's reign, he refused to sign the declaration of the bishops, testifying their abhorrence of that rebellion, and an exhortation to the clergy and people under their care, to be zealous in the discharge of their duties to his majesty king George. Dr Atterbury constantly opposed the measures of the court in the house of lords, and drew up some of the most violent protests with his own hand. At length, however, he fell a victim to the intrigues of his enemies, who, under pretence of his having engaged in a plot in favour of the pretender, were the means of driving him into exile in the year 1723. His learned friend bishop Smalridge, in the speech he made when he presented him to the upper house of convocation, is prolucely, styles him "Vir in nullo literarum genere lapsus, in plerisque artibus et studiis diu et feliciter exercitatus, in maxime perfectis literarum disciplinis perfectissimus." He was the friend of Pope, Swift, and other wits of his time. In his controversial writings, he was some times too severe upon his adversary, and dealt rather too much in satire and invective. He died at Paris, Feb 15 1731 and his body being brought over to England was interred in Westminster-abbey, but without any memorial being placed over him.

We shall here insert Mr Pope's fine epi-

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taph on the bishop, written in the form of a dialogue between himself and his daughter, supposed to be expiring in his arms, immediately after her arrival in France to see him.

*Dialogue*

*She* "Yes, we have lived,—one pang, and then we part!"

*May heaven, dear father! now have all thy heart*

*Yet, ah! how much we lov'd, remember still, I'll you are dust like me —*

*He* "Dear shade! I will

Then mix this dust with thine—O spotless ghost!"

O more than fortune, friends, or country lost! Is there on earth, one care one wish be id?

Yes, *Save my country, Heaven,* he said, and died.

**TO ATTEST** *v a* (attestor, Latin) 1 To bear witness of, to witness (*Addison*) 2 To call to witness (*Dryden*)

**ATTESTER** *s* (from the verb) Witness, testimony, attestation (*Milton*).

**ATTESTATION** *s* (from *attest*) Testimony, witness, evidence (*Woodward*).

**ATTIC** any thing relating to Attica, or to the city of Athens. Thus Attic salt in philology, is a delicate poignant sort of wit and humour peculiar to the Athenian writers, Attic witness a witness incapable of corruption, &c.

**ATTIC ORDER**, a kind of little order, after the manner of a pedestal, raised on another larger order, by way of a finish to the building.

**ATTIC BASE** a peculiar kind of base used by the ancient architects in the Ionic order and by Palladio, and some others, in the Doric.

**ATTIC STORY**, in architecture, a story in the upper part of a house, where the windows are usually square.

**ATTIC DIALECT**, in grammar. See **DIALECT**.

**ATTICA**, an ancient kingdom of Greece situated along the north coast of the gulph of Saron, bounded on the west by Megara, mount Citharon, and part of Boeotia, on the north by the gulph of Euripus now *Stretto di Negro Ponte*, and the rest of Boeotia, and on the east by the Europus. The chief cities in Attica were Athens, Eleusis, and Rhamnus. This kingdom received its name from Attus, daughter of Cranaus, second king of Athens.

**ATTICUS**, one of Cilius's servants who entered his palace with a bloody sword, and declared he had killed Otho (*Tacitus*). T Pomponius, a celebrated Roman knight to whom Cicero wrote a great number of letters, which contained the general history of the age. They are now extant, and divided into seventeen books. He was such a perfect master of the Greek writers, and spoke their language so fluently, that he was surnamed Atticus. He behaved in such a disinterested manner, that he offended neither of the municipal parties at Rome, and both were equally anxious of courting his approbation. He died of a fever in his 77th year, B C 32. *Conc-*



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thus Nepos, one of his intimate friends, has written a minute account of his life

**ATTIGUOUS** *a* (*attiguus*, Lat.) Hard by

To **ATTINGE** *v a* (*attinger*, Fr.) To touch lightly or gently

To **ATTIRE** *v a* (*attirer*, Fr.) To dress, to habit, to array (*Spenser*)

**ATTIRE** *s* (from the verb) 1 Clothes, dress, habit (*Davies*) 2 [In hunting] The horns of a buck or stag 3 [In botany] The flower of a plant is divided into three parts, the calyx, the corolla, and the stamen

**ATTIREUR** *s* (from *attire*) One that attires another a dresser

**ATTITUDE** *s* (*attitude*, Fr.) The posture or action in which a statue or painted figure is placed (*Prior*)

**ATTLBURY**, a town in Norfolk having a market on Thursdays

**ATTOLENS AURUM** (*attollen* from *attollo*, to lift up) A common muscle of the ear, which arises thin, broad, and tendinous, from the tendon of the occipito frontalis, from which it is almost inseparable, where it covers the aponeurosis of the temporal muscle, and is inserted into the upper part of the ear, opposite to the antihelix. Its use is to draw the ear upwards, and to make the parts into which it is inserted tense

**ATTOLLENT** *a* (*attollens*, Lat.) That raises or lifts up (*Derham*)

**ATTORNEY**, **ATTORNATUS**, or **ATTORNATUS**, in law, a person appointed by another to do something in his stead, particularly to solicit and carry on a law suit. The word is compounded of the Latin *ad* to, and the French *tourner*, to turn, and to turn a business over to another. The ancient Latin name, according to Bracton is *responsalis*

**ATTORNEY AT LAW**, a person retained to prosecute or defend a law suit. Attorneys, being properly those who sue out writs, or process, or commence, carry on, and defend actions, in any of the courts of common law, are distinguished from solicitors, as the latter do the like business in the courts of equity, and none are admitted, either as in attorney or solicitor, unless they have served a clerkship of five years, being enrolled, and taken the oath in that case provided, and the judges of their respective courts are required to examine their several capacities. By a late order of all the judges, all attorneys are to be admitted of some Inns of court or chancery (except house-keepers in London and Westminster &c.) and no attorney shall put himself out of that society into which he is admitted till he is admitted to some other society, and deliver a certificate thereof, and all attorneys are to be in communion at the times ordered by the society to which they belong, otherwise shall be put out of the roll of attorneys. Attorneys may be punished for ill practices and if an attorney, or his clerk, of which he must have but two at one time, do any thing against the express rules of the court, he or they may be committed. Attorneys are liable to be punished for the neglect

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of a client's cause. Attorneys have the privilege to sue and be sued only in the courts of Westminster, where they practise

In order to admission a solicitor or attorney in any of the great courts of sessions in Wales, or in the counties palatine of Chester, Lancaster, or Durham, or in any court of record in England, holding pleas to the amount of 40 shillings, and not in any of the said courts of Westminster, there shall be charged a stamp duty of 50/. Every attorney, solicitor, notary, proctor, agent, or procurator, practising in any of the courts at Westminster, ecclesiastical, admiralty, or Cinque port courts in his majesty's courts in Scotland, the great sessions in Wales, the courts in the counties palatine, or in any other courts holding pleas to the amount of 40 shillings, or more, shall take out a certificate annually, upon which there shall be charged if the solicitor &c. residing within the bills of mortality, a stamp duty of 5/ in any other part of Great Britain 3/. Persons practising after the 1st day of November, 1797, without obtaining a certificate, shall forfeit 50/ and be incapable of suing for any fees. An attorney shall not be elected into any office against his will, such as constable, overseer of the poor, or churchwarden, or any office within a borough, but his privilege will not exempt him from serving in the militia, or finding a substitute. Black Rep 1123

**ATTORNEY OF THE DUCHY OF LANCASTER**, the second officer in that court

**ATTORNEY GENERAL**, a great officer under the king, created by letters patent, whose office is to exhibit information, and prosecute for the crown in criminal causes, and to file the bills in the exchequer, for any thing concerning the king in inheritance or profits. To him come warrants for making of grants, pardons, &c.—his salary from the crown is 1000/ per ann

To **ATTORNEY** *v a* (from the noun) 1 To perform by proxy (*Shakspeare*) 2 To employ as a proxy (*Shakspeare*)

**ATTORNEYSHIP** *s* (from *attorney*) The office of an attorney, proxy (*Shakspeare*)

**ATTORNEMENT** *s* (*attournement*, Fr.) A yielding of the tenant to a new lord (*Conell*)

To **ATTRACT** *v a* (*ultraho*, *attractum*, Latin) 1 To draw to something (*Brown*) 2 To allure, to invite (*Milton*)

**ATTRACT** *s* (from the verb) Attraction, the power of drawing not used (*Hudibras*)

**ATTRACTIVE** *a* (from *attract*) Having the power to draw to it (*Ray*)

**ATTRACTION** **ATTRACIO**, or **TRACTIO**, in mechanics, the act of a moving power, whereby a moveable is drawn, or brought nearer to the mover. The word is compounded of *ad*, to, and *traho*, I draw. As action and reaction are always equal and contrary, it follows, that, in all attraction, the mover is drawn towards the moveable, as much as the moveable towards the mover

**ATTRACTION**, or **ATTRACTIVE POWER**, in physics, a general term used to denote the

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cause, power, or principle, by which all bodies mutually tend towards each other, and cohere, till separated by some other power. The laws, phenomena, &c. of attraction, form the chief subject of Newton's philosophy, these being found to obtain in almost all the wonderful operations of nature.

The principle of attraction, in the Newtonian sense of it, was first surmised by Copernicus. "As for gravity," says he, "I consider it as nothing more than a certain natural appetite (*appetentia*) that the Creator has impressed upon all the parts of matter in order to their uniting or coalescing into a globular form, for their better preservation, and it is probable that the same power is also inherent in the sun and moon and planets, that those bodies may constantly run in that round form in which we see them" (*De revol. Orb. Cælest. lib. 1. cap. 9*). Kepler calls gravity a corporeal and mutual affection between similar bodies in order to their union. (*Ast. Nov. in Introd.*) And he pronounced more positively that no bodies whatever were absolutely light, but only relatively so, and consequently that all matter was subjected to the power and law of gravitation. *Ibid.*

The first in this country who adopted the notion of attraction was Dr Gilbert, in his book *De Magnete*, and the next was the celebrated Lord Bacon, in his *Nov. Organ. lib. 2. aphor. 36, 45, 48. Syl. cent. 1. exp. 33*, also in his treatise *De Motu*, particularly under the articles of the 9th and the 13th sorts of motion. In France it was received by Descartes and Roberval, and in Italy by Galileo and Borrelli. But till Newton appeared, this principle was very imperfectly defined and applied.

Before Newton, no one had entertained such correct and clear notions of the doctrine of universal attraction as Dr Hooke, who in his "Attempt to prove the Motion of the Earth, 1671," observes that the hypothesis upon which he explains the system of the world is founded upon the three following principles: 1. That all the celestial bodies have not only an attraction or gravitation towards their proper centres, but that they mutually attract each other within their sphere of activity. 2. That all bodies which have a simple and direct motion continue to move in a right line, if some force, which operates without ceasing, does not constrain them to describe a circle, an ellipse, or some other more complicated curve.

But attraction is so much the more powerful as the attracting bodies are nearer to each other. But Hooke was not able to solve this general problem relative to the law of attraction, on which he could occasion a body to describe an ellipse round another quiescent body placed at one of its foci, this admirable discovery, which requires the aid of the higher geometry, and does the highest honour to the human mind, being reserved for the genius of Newton.

When we consider as it regards celestial bodies, the attraction of the sun and planets, under the name of gravity. The first case is

usually denoted by the word attraction, or universal gravitation, the second by gravitation, and the third, by the words affinity, chemical attraction or molecular attraction. Many philosophers are now of opinion that it is the same force contemplated under different aspects, yet constantly subject to the same law.

*Principle.* At a finite distance all the bodies in nature attract one another in the direct ratio of the masses, and the inverse ratio of the square of the distance.

1. According to a law of Kepler deduced from observation, the radii vectores of planets and comets describe about the sun areas proportional to the times, but this law can only have place so long as the force which incessantly deflects each of these bodies from the right line is constantly directed towards a fixed point, which is the origin of the radii vectores (see CENTRAL FORCES). The tendency, therefore, of the planets and comets towards the sun, follows necessarily from the proportionality of the areas described by the radii vectores to the times of description; this tendency is reciprocal. It is in fact, a general law of nature that action and reaction are equal and contrary; whence it results that the planets and comets react upon the sun, and communicate to it a tendency towards each of them.

2. The satellites of Uranus tend towards Uranus, and Uranus towards his satellites; the satellites of Saturn tend towards Saturn, and Saturn towards them. The case is the same with regard to Jupiter and his satellites. The earth and moon tend likewise reciprocally the one towards the other. The proportionality of the areas described by the satellites to the times of description, concur with the equality of action and reaction, to render these assertions unequivocal.

All the satellites have a tendency towards the sun, for they are all animated by a regular motion about their respective planets, as if they had been immovable; whence it results that the satellites are impelled with a motion common also to their planets, that is to say, that the same force, by which the planets tend incessantly towards the sun, acts also upon the satellites; and that they are carried towards the sun with the same velocity as the planets. And since the satellites tend towards the sun, it follows that the sun tends towards them, because of the equality of action and reaction.

3. Observations have convinced us that Saturn deviates a little from his path when he is near Jupiter, the largest of the planets, whence it follows that Saturn and Jupiter tend reciprocally the one towards the other. Saturn, it was observed by Flamsteed, disturbs the motion of Jupiter's satellites, and draws them a little towards him, which proves that these satellites tend towards Saturn and Saturn towards them.

It is therefore true that all the heavenly bodies tend reciprocally towards one another; but the tendency, or rather the attractive force which acts on it, operates not solely to

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their aggregate mass, all their molecular partake of it, or contribute to it. If the sun acted exclusively upon the centre of the earth, without attracting each of its particles, the undulations of the ocean would be incomparably greater, and very different from those which are duly presented to our view. The tendency of the earth towards the sun is therefore the result of the sum of the attractions exerted upon all the molecules, which consequently attract the sun in the ratio of their respective masses. Besides, every body upon the earth is attracted towards its centre proportionally to its mass. It reacts therefore upon it the attraction following the same ratio. If it were otherwise, if all the parts of the earth did not exert upon one another a reciprocal attraction, the centre of gravity of the earth would move by a constantly accelerating motion, till at length it would be lost beyond the limits of the system.

The attraction is therefore universal, reciprocal, and proportional to the mass. It remains to demonstrate that this force is inversely as the square of the distance.

1. Observations have shown that the squares of the periodic times of the celestial bodies are proportional to the cubes of the mean distances. Further, it is rigorously demonstrable (see CENTRAL FORCES) that when bodies circulate in such manner that the squares of the periodic times are proportional to the cubes of the distances, the centripetal force which actuates them is in the inverse ratio of the square of the distance. Therefore, supposing the planets to move in circular orbits (from which they, in fact, differ but little) they are solicited towards the sun by a force which varies inversely as the square of the distance. This supposition is not

But the constant relation of the squares of the periodic times, to the cubes of the distances, being independent of the eccentricity, would doubtless subsist in the case where the eccentricity vanishes; that is, if the planets moved in circular orbits. Indeed the truth of the position may be readily established with regard to elliptical orbits. But we omit the demonstration, rather than protract this article to too great a length.

2. If the planets revolve about the sun in virtue of a central force, which is reciprocally as the square of the distance, it is natural to infer that the moon is retained in her orbit by a central force directed towards the earth, and which only differs from the gravity of terrestrial bodies in the ratio of the diminution that is occasioned by the augmentation of the square of the moon's distance. Now, it may be shown that the revolution of the moon about the earth is a phenomenon of the same kind, and to be accounted for in the same manner (that is, by considering the joint operation of the projectile and gravitating forces) as the curvilinear motion of a stone, bullet, or any other projectile near the surface of the earth. If we had engines of a sufficient force to project a body in a right line parallel to the horizon, with the velocity of 24326 Paris feet

(nearly five English miles) in a second of time, that body, setting aside the resistance of the air, would revolve about the earth like a moon. For, 24326 is a mean proportional between 39231600, the diameter of the earth, and  $15\frac{1}{2}$ , the space described in the first second of time by a heavy body falling from quiescence towards the earth. And the periodical time of such a projectile would be nearly equal to 1 hour, 24 minutes, 27 seconds. If this body could be carried to the distance of the moon, and projected in the same direction as that in which the moon moves, with such a velocity as would carry it through 188489 Paris feet in a minute, it would revolve about the earth in the same orbit as is described by the moon. We know from experience, that the motion with which a body near the surface of the earth tends to its centre is such as in a second of time makes it descend through  $15\frac{1}{2}$  Paris feet. Supposing this motion to decrease inversely as the square of the distance, at the distance of the moon, which is equal to 60 semidiameters of the earth, it would be  $60 \times 60$  times less than at the surface of the earth, and therefore at that distance would be sufficient to make a body descend through  $15\frac{1}{2}$  Paris feet, in a minute of time. This is, in fact, the space through which the moon, at the distance of 60 semidiameters of the earth, descends from the tangent of its orbit, towards the centre of the earth in a minute of time. For that space is a third proportional to the diameter of the moon's orbit, and the arc described in the same time. And 235389000 (the diameter of the moon's orbit in Paris feet) is to 188489 (the arc described in a minute), as 188489 is to  $15\frac{1}{2}$ . Thus the motion agrees in quantity as well as in direction with the legitimate inferences from the motions of projectiles near the earth. And these phenomena are so perfectly coincident and similar, that they must be referred to the same principles, namely a projectile force and a gravitating force varying inversely as the squares of the distances.

In establishing this law of attraction we have considered the centres of bodies, though the gravity is proper to each of their molecules, because, in spheres, spheroids differing but little from them, the attraction of the molecular most distant from the attracted point, and those of the nearest molecule, mutually compensate in such manner that the total attraction is the same as if the molecules were united at their centre of gravity.

This law of spheres suffers various modifications, when the bodies attracted are at the surface or in the interior of the spheres. A body situated within a spherical shell, throughout of the same thickness, is equally attracted on all sides, so that it will remain at rest in the midst of the attractions it experiences. The same thing obtains within an elliptical shell whose interior and exterior surface are similar and similarly placed. Supposing, therefore, that the planets or homogeneous spheres, the gravity in their interior diminishes as the distance from their centres, for the exterior enve-

# ATTRACTION

lope contributes not to the gravity, which is only produced by the attraction of a sphere of a radius equal to the distance of the attracted body from the centre of the planet. But this attraction is proportional to the mass of the sphere divided by the square of its radius: the mass is as the cube of the same radius: the gravity of the bodies is therefore proportional to such radius.

It will, however, be proper to observe, 1. That this latter result is only rigorous on the hypothesis of the homogeneity of the planets. They are probably composed of strata more and more dense as they approach the centre: the gravity below the surface diminishes therefore, in a less ratio than in the case of their homogeneity. 2. The same result can only be exact by abstracting the molecular attraction which always obtains when a body is placed upon the surface of a sphere. This attraction is very great at contact, nothing at a sensible distance, whence it results that the molecule in contact and that which is situated at the opposite extremity of the same diameter, do not attract as if they were united at the centre.

We need hardly say how unjust it is in many foreign philosophers to declare it unjust a principle which furnishes so beautiful a view, for no other reason but because they cannot conceive how one body should act on another at a distance. It is certain, philosophy allows of no action but what is by immediate contact and impulsion, for how can a body exert any active power where it does not exist? Yet we see effects without seeing any such impulse, and where there are effects, we can easily infer there are causes whether we see them or no. But a man may consider such effects without entering into the consideration of the causes, as indeed it seems the business of a philosopher to do: for to exclude a number of phenomena which we do see, will be to leave a great chasm in the history of nature: and to argue about the actions which we do not see, will be to build castles in the air. It follows, therefore, that the phenomena of attraction are matter of physical consideration, and as such entitled to a share in the system of physics, but that the causes thereof will only become so when they become sensible: i.e. when they appear to be the effect of some other higher causes, for a cause is no otherwise seen than as itself is an effect, so that the first cause must needs be always invisible: we are therefore at liberty to suppose the causes of attraction what we please, without any injury to the effects. See GRAVITY.

In Mr Isaac Newton's Philosophy, the research into causes is the last thing, and never comes under consideration till the laws and phenomena of the effect are settled, it being to these phenomena that the cause is to be ascribed. The cause even of any the grossest and most sensible action, is not adequately known. How impulse or percussion itself produces its effects, or how motion is communicated by body to body, confounds the deepest philosophers: yet is impulse received

not only into philosophy, but into mathematics and accordingly the laws and phenomena of its effects make the greatest part of common mechanics.

The other species of attraction, therefore, in which no impulse is remarkable, when their phenomena are sufficiently ascertained, have the same title to be promoted from physical to mathematical consideration, and this without any previous inquiry into their causes, which our conceptions may not be proportionate to let their causes be occult, as all causes strictly speaking are, so that their effects, which alone immediately concern us, be but apparent, and measurable.

Our great philosopher, then, far from adulterating science with any thing foreign or metaphysical, as many have reproached him with doing, has the glory of having thrown every thing of this kind out of his system, and of having opened a new source of sublimer mechanics, which duly cultivated might be of infinitely greater extent than all the mechanic yet known. It is hence alone we must expect to learn the manner of the changes, prodigious generations, corruptions, &c. of natural things: with all that secret or wonders opened to us by the operations of chemistry.

*Attraction chemical* See AFFINITY and MOLECULAR ATTRACTION.

*Attraction of cohesion* See COHESION.

*Electrical Attraction*, the action of a body actually electrified, or rather of the ambient fluid upon light bodies presented to it within a certain distance.

Philosophers have long conjectured that the electric fluid underwent, in the same manner as light and gravitation, a diminution of force proportional to the square of the distance, but their conjectures were founded merely upon analogy. It was reserved for Coulomb to convert them into a truth demonstrated by the testimony of an ingenious and decisive experiment performed by means of the electric balance. Huxley's Philosophy, by Gregory, vol I p. 353.

*Magnetical Attraction*, the action which the lodestone exercises upon all bodies in nature, but especially upon iron.

Coulomb has demonstrated, by means analogous to those he employed in electricity, that magnetic attractions and repulsions are likewise in the inverse ratio of the square of the distance.

*Molecular Attraction*, the force by which the molecules of bodies mutually attract each other, and unite more or less closely, when the distance which separates them becomes inensurable.

This force received from the earlier chemists the name of affinity: but many authors prefer the denoting it by that of molecular attraction: or chemical attraction, the preference being founded upon this that the latter denomination is simple, that it presupposes nothing, and that it expresses solely what strikes our sense: when this force is in action, while the word affinity has been employed from its origin, to express sometimes moral relations, sometimes metaphysical but, sometimes the connections

# ATTRACTION

which spring from a common parentage See **AFFINITY**

Formerly it was usual to distinguish as many species of affinity as presented different phenomena, hence arose the division of affinity into affinity of aggregation, affinity of composition, affinity of dissolution, affinity of precipitation, simple affinity, double affinity, reciprocal affinity, hygrometric affinity, &c &c But all these affinities are only one and the same force considered under different aspects and in different circumstances we reduce them to three, which will comprise all the other, these are, simple attraction, elective attraction, and complex attraction

*Simple attraction* is that which is exerted between two substances simple or compound, provided that in each the composing principles act only by a collective force

If the two substances are of the same kind, we obtain a homogeneous whole, whose parts are enchaind by the attractive force, which then takes the name of force of aggregation or cohesive force A block of marble, a piece of sulphur are formed of homogeneous molecules, which the attraction unites more or less closely, according as it has more or less activity and energy

If the substances in question are of different kinds, the attractive force which operates upon them experiences variations which are treated at large by our ablest chemical authors

*Elective Attraction* obtains so often as to a compound of two substances there is presented a body which has more attraction with regard to one of the constituents, than those constituents have towards one another In elective attraction there are always three forces in action

*Experiment* Pour sulphuric acid into a solution of muriatic barytes, the liquor will immediately appear troubled, and white matter will precipitate itself to the bottom of the vessel Now what takes place in this experiment? The muriatic acid holding to the barytes with a certain force established by nature, is attacked by the sulphuric acid, to which nature has given an attractive force upon the barytes greater than that of the muriatic acid upon that alkaline substance hence, the barytes having been drawn to the muriatic acid by a force greater than what attracted it towards the sulphuric acid, and making a kind of choice between these two bodies, it is taken over to the latter, and forms with it a new compound insoluble in water which is precipitated to the bottom of the vessel

*Complex Attraction* has place whenever a compound of two substances cannot be decomposed by a simple substance, but by that substance combined with another so that here four forces are brought into action, of which the concurrence forms a complex attraction The better to comprehend their action, they may be decomposed, and those which concur to break the existing combinations opposed to those which tend to their conservation To the

first of these are given the name of divellent attractions, and to the latter those of quiescent attractions

If the quiescent attractions prevail over the divellent ones, there will not be any change effected in the combinations, but if the divellent attractions are strongest, the existing combinations are dissolved and new ones formed

The laws of molecular may probably be referred to those of universal attraction It is to the illustrious Newton that we are indebted for having established the existence of the attraction between great masses, demonstrated the laws by which that attraction is regulated, and applied it to the unviling the mechanism of the planetary system the same laws also appeared to him to give birth to the phenomena of molecular attraction, but with regard to the actual identity of these two forces, this great philosopher did little more than form conjectures

The disciples of Descartes sought in the phenomenon of molecular attraction new arms to combat the theory of Newton, and thus presented to their vortices, driven without hope from the celestial regions, an asylum where they again took refuge On the other hand the Newtonians endeavoured to prove that these fresh phenomena depended exclusively upon attraction but this attraction appeared to them different from that which animated the great masses, and was subjected to other laws Some made it depend upon the inverse ratio of the cube of the distance, others upon the mixed ratio of the inverse of the square and the inverse of the cube

Buffon was, we believe, the first who maintained against both chemists and mathematicians, the identity of the molecular and the Newtonian attraction But his opinion as to this subject, given in his second *View of Nature*, can be regarded as little else than a simple guess unsupported by those rigorous proofs which force conviction

M Libe, author of the *Nouveau Dictionnaire de Physique*, endeavours to reduce the molecular attraction to the Newtonian, to show that they are one and the same force subject to the same law, to show how from this general law emanate those particular laws which distinguish molecular attraction, and thus to refer to the admirable principle of gravitation, those phenomena which have been thought to contradict it, though they, in fact, confirm its existence It would lead us far beyond the limits assigned to this article, were we to insert the whole of M Libe's ingenious investigations, we can only quote his most popular argument To show that two elementary molecules in contact ought to exert upon one another an infinite action, while the law of attraction is directly as the masses and inversely as the squares of the distances his reasoning is simply this If the masses of two finite bodies which attract each other, were to become infinitely small, the attraction which they would exercise the one upon the other

# A T T R A C T I O N .

would experience, in respect of the masses, an infinite diminution. But if those masses, thus become infinitely small, are in contact, their centre will be found infinitely near to one another, consequently, the attraction which follows the inverse ratio of the squares of the distances, having augmented infinitely more with regard to the approach of the centres of action, than it has diminished by reason of the extreme minuteness of the masses, the result must be an infinite attraction. See Libes, ubi supra, Lambert's Translation of Barthollet's chemical Statics, and Gregory's translation of Haüy's Philosophy.

*Attraction of Mountains*, is a late discovery, and a very considerable confirmation of sir Isaac Newton's theory of universal gravity. According to the Newtonian system, an attractive power is not only exerted between the large masses of matter which constitute the sun and planets, but likewise between all comparatively smaller bodies, and even between the smallest particles of which they are composed. Agreeably to this hypothesis, a heavy body, which ought to gravitate or tend toward the centre of the earth, in a direction perpendicular to its surface, supposing the said surface to be perfectly even and spherical, ought likewise though in a less degree, to be attracted and tend towards a mountain placed on the earth's surface, so that a plumb line, for instance, of a quadrant, hanging in the neighbourhood of such a mountain, ought to be drawn from a perpendicular situation, in consequence of the attractive power of the quantity of matter of which it is composed acting in a direction different from that exerted by the whole mass of matter in the earth, and with a proportionably inferior degree of force.

Though sir Isaac Newton had long ago hinted at an experiment of this kind, and had remarked that "a mountain of an hemispherical figure, three miles high, and six broad, would not by its attraction, draw the plumb-line two minutes out of the perpendicular yet no attempt to ascertain this matter by actual experiment was made till about the year 1738, when the French academicians, particularly Messrs Bouguer and Condamine, who were sent to Peru to measure a degree under the equator, attempted to discover the attractive power of Chimborazo, a mountain in the province of Quito. According to their observations, which were however made under circumstances by no means favourable to an accurate solution of so nice and difficult a problem, the mountain Chimborazo exerted an attraction equal to eight seconds. Though this experiment was not perhaps sufficient to prove satisfactorily even the reality of an attraction, much less the precise quantity of it, yet it does not appear that any steps had been since taken to repeat it.

In the year 1772, the present astronomer royal, Dr Maskelyne, made a proposal for this purpose to the Royal Society, and in 1774 he was deputed to make the trial, accompanied

with proper assistants, and furnished with accurate instruments. The mountain Schehallien, situated nearly in the centre of Scotland, was pitched upon as the most proper for the purpose that could be found in this island. The observations were made by taking the meridian zenith distances of different fixed stars near the zenith, by means of a zenith sector of ten feet radius, first on the south, and afterwards on the north side of the hill, the greatest length of which extended in an east and west direction.

It is evident, that if the mass of matter in the hill exerted any sensible attraction, it would cause the plumb line of the sector, through which an observer viewed a star in the meridian, to deviate from its perpendicular situation, and would attract it contrariwise at the two stations, thereby doubling the effect. On the south side the plummet would be drawn to the northward, by the attractive power of the hill placed to the northward of it, and on the north side, a contrary and equal deflection of the plumb line would take place in consequence of the attraction of the hill, now to the southward of it. The apparent zenith distances of the stars would be affected contrariwise, those being increased at the one station which were diminished at the other, and the correspondent quantities of the deflection of the plumb-line would give the observer the sum of the contrary attractions of the hill acting on the plummet at the two stations, the bill of which will of course indicate the attractive power of the hill.

The various operations requisite for this experiment lasted about four months, and from them it appears, that the sum of the two contrary attractions of the mountain Schehallien in the two temporary observations which were successively fixed half-way up the hill (where the effect of its attraction would be greatest) was equal to 11" 6. Its half, therefore, or 5" 8 is the mean attraction of the mountain.

The inferences drawn from these experiments may be reduced to the following.

"1. It appears that the mountain Schehallien exerts a sensible attraction, therefore, from the rules of philosophising, we are to conclude that every mountain, and indeed every particle of the earth is endued with the same property, in proportion to its quantity of matter.

"2. The law of the variation of this force, in the inverse ratio of the squares of the distances, as laid down by sir Isaac Newton, is also confirmed by this experiment. For if the force of attraction of the hill had been only to that of the earth as the matter in the hill to that of the earth, and had not been greatly increased by the near approach to its centre, the attraction thereof must have been wholly insensible. But now, by only supposing the mean density of the earth to be double to that of the hill, which seems very probable from other considerations, the attraction of the hill will be reconciled to the general law of the variation of attraction in the inverse duplicate

ratio of the distances, as deduced by sir Isaac Newton from the comparison of the motion of the heavenly bodies with the force of gravity at the surface of the earth, and the analogy of nature will be preserved

"3 We may now, therefore, be allowed to admit this law, and to acknowledge, that the mean density of the earth is at least double of that at the surface, and consequently that the density of the internal parts of the earth is much greater than near the surface Hence also, the whole quantity of matter in the earth will be at least six times as great as if it had been all composed of matter of the same density with that at the surface, or will be about four or five times as great as if it were all composed of water—This conclusion, Dr Maskelyne adds, is totally contrary to the hypothesis of some naturalists who suppose the earth to be only a great hollow shell of matter, supporting it self from the property of its arch, with an immense cavity in the midst of it But, were that the case, the attraction of mountains, and even smaller inequalities in the earth's surface, would be very great, contrary to experiment and would affect the measures of the degrees of the meridian much more than we find they do, and the variation of gravity, in different latitudes, in going from the equator to the poles, as found by pendulums would not be nearly so regular as it has been found by experiment to be

"4 As mountains are by these experiments found capable of producing sensible deflections of the plumb lines of astronomical instrument, it becomes a matter of great importance, in the mensuration of degrees in the meridian either to choose places where the irregular attractions of the elevated parts may be small or where by their situation, they may compensate or counteract the effects of each other Phil Trans vol 65 See also the important observations and calculations relative to this subject by Dr Hutton, in Phil Trans vol 68 And in ingenious paper by Mr Cavendish in vol 88 of those Transactions

**ATTRACTIVE** *a* (from *attract*) 1 Having the power to draw any thing (*Milton*) 2 Inviting, alluring, enticing (*Shakespeare*)

**ATTRACTIVE** *s* (from *attract*) 1 That which draws or incites 2 Allurement (*Southey*)

**ATTRACTIVITY** *ad* (from *attractive*) With the power of attracting

**ATTRACTIVENESS** *s* (from *attractive*) The quality of being attractive

**ATTRACTOR** *s* (from *attract*) The agent that attracts a drawer (*Brown*)

**ATTRAHENT** *s* (*atrahens* Lat) That which draws (*Glennville*)

**ATTRIBUTABLE** *a* (*attributio*, Lat) That may be ascribed or attributed, a credible, imputable (*Hale*)

**To ATTRIBUTE** *v a* (*attribuo* Lat) 1 To ascribe, to yield as due (*Tulstenson*) 2 To impute, to ascribe to a cause (*Newton*)

**ATTRIBUTE**, in general sense, that which agrees with some person or thing or a quality *quiddam*, something to be after a certain

manner Thus understanding is an attribute of mind, and extension an attribute of body That attribute which the mind conceives as the foundation of all the rest, is called its essential attribute thus extension is by some, and solidity by others, esteemed the essential attributes of body or matter

**ATTRIBUTES**, in theology, the several qualities or perfections of the divine nature The perfections of God are called his attributes, because he cannot be without them The natural attributes of the Supreme Being may be comprehended under power and knowledge, the moral ones under justice and benevolence See Hartley on Man, vol 11 Groves Works, vol 11 Doddridge's Works, vol 11 Bilguys Divine Rectitude, Wollaston's Rel of Nature, p 116—119, &c

**ATTRIBUTES**, in logic, are the predicates of any subject or what may be affirmed or denied of any thing

**ATTRIBUTES** in painting and sculpture, are symbols added to several figures, to intimate their particular office and character Thus the eagle is an attribute of Jupiter, a peacock of Juno, a caduceus, of Mercury a club, of Hercules, and a palm, of Victory

**ATtribution** *s* (from *To attribute*) Commendation, qualities ascribed (*Shakspeare*)

**ATTRIBUTIVE**, in grammar, are words which are significant of attributes and thus include adjectives verbs, and particles which are attributes of substances and adverbs, which denote the attributes only of attributes

**ATTRITION** *a* (*attritio* Lat, Ground worn by rubbing (*Milton*)

**ATTRITIONESS** *s* (from *attritio*) The being much worn

**ATTRITION** *s* (*attritio* Lat) 1 The act of wearing things by rubbing one against another (*Woodward*) 2 The state of being worn 3 Grief for sin arising only from the fear of punishment, the lowest degree of repentance

**To ATTUNE** *v a* (from *tune*) 1 To make any thing musical (*Milton*) 2 To tune one thing to another

**ATWIST** *ad* or *prep* Between, between in the midst of two things obsolete (*Spenser*)

**ATWOODS MACHINE** the name which is very properly applied to the ingenious apparatus invented by the late Mr Atwood of Trinity college Cambridge to illustrate the doctrines of accelerated motion This machine has been found to answer the purpose far more completely than any other we have heard of, discovering at once the quantity of matter moved, the force which moves it the space described from rest the time of description and the velocity acquired

The velocity produced by the undiminished force of gravity, is much too great to be conveniently submitted to experimental examination, but by means of this apparatus, we can diminish it in any degree that is required Two boxes which are attached to a thread passing over a pulley, may be filled with different



weights, which counterbalance each other, and constitute, together with the pulley, an inert mass, which is put into motion by a small weight added to one of them. The time of descent is measured by a seconds, or a half-second's pendulum, the space described being ascertained by the place of a moveable stage, against which the bottom of the descending box strikes and when we wish to determine immediately the velocity acquired at any point, by measuring the space uniformly described in a given time, the accelerating force is removed, by means of a ring, which intercepts the preponderating weight, and the box proceeds with a uniform velocity, except so far as the friction of the machine retards it. By changing the proportion of the preponderating weight to the whole weight of the boxes, it is obvious that we may change the velocity of the descent, and thus exhibit the effects of forces of different magnitudes. For a more minute description of this curious and useful apparatus illustrated by plates, see Atwood on Rectilinear and Rotatory Motion, p. 298, or Gregory's Mechanics, vol. ii. p. 64.

**ATYADÆ**, the first race of kings who reigned in Lydia, so called from Atys the son of Clys and grandson of Manes. The atyadæ were succeeded by the heraclidæ.

**ATYS**, in fabulous history. See **ATYADÆ**.

**AVA**, in geography, an empire in India, beyond the Ganges, in Asia. It is bounded by Mogulistan on the west, Siam on the south, Tonquin and Cochinchina on the east, and Thibet and China on the north. The metropolis of this empire is of the same name, and is situated in Lat. 21° 0' N. Lon. 96° 30' E.

**AVA**, in natural history, the intoxicating juice of the pipe methysticum (see **PIPER**), obtained from its root, which the natives of the South sea islands bruise for this purpose, and afterwards chew with an effect vastly more exhilarating than the insatiation of tobacco.

**TO AVAIL** *v a* (from *ai'la*, French.)

- 1 To profit, to turn to profit (*Dryden*)
- 2 To promote, to prosper, to assist (*Pope*)

**AVA'ILE** *s* (from *To avail*) Profit, advantage, benefit (*Locke*)

**AVAILABLE** *a* (from *avail*) 1 Profitable, advantageous (*Hooker*) 2 Powerful, having force (*Raleigh*)

**AVAILABILITY** *s* (from *avail*) 1 Power of promoting the end for which it is used (*Hale*) 2 Legal force, validity

**AVAILABLY** *ad* (from *available*) 1 Powerfully, profitably, advantageously 2 Legally, validly

**AVAILMENT** *s* (from *avail*) Usefulness, advantage, profit

**AVAILANCH**, or **LAVANGE**, according to Baretta and others, a prodigious mass or ball of snow which is blown down from the top of a mountain by the wind, or falls by some other accident, which gathering all the way in its descent becomes instantly of such a prodigious size, that there is hardly any avoiding being carried away with it, man and beast, and smothered in it. One of these balls Baretta saw

tolling down, but as it took another course than his, he had no apprehensions of danger from it.

Lavanges or avalanches take place when the snow, falling in vast flakes, is agitated on the flank of the mountains, particularly Mount Blanc, by impetuous winds, which fold it on itself and condense it. At those times a species of balloons, formed by the snow, is frequently precipitated of which the bulk increases so greatly that even the rocks cannot arrest those prodigious masses in their redoubled fall.

Already the terrified inhabitant of the valleys conscious of his approaching destruction, and unable to flee from it, presages the disaster from the horrible hissing noise which attends it. He is often the victim before he is struck. Whole forests have been rooted up, houses, and even entire villages completely overturned and swept away before the immediate shock of the lavange, by the explosion of the forcibly compressed air.

Several chests of goods which were in the cellar of a house thus rased, were burst open by the explosion and hurled into the street. It was seen with wonder that put of the effects contained in them, were cast on the opposite mountain, to the height of sixty feet above the base. It was also observed that the house was overthrown some little time before the mass of snow and the shock reached it.

When these masses, driven on declivities, preceded and followed by the ruins which they drag along, happen to fall in the valleys, not the least vestiges of the inhabitants or their flocks remain every thing is annihilated, or at least buried under the ruins of the mountain, which often fill up the mouths of narrow passages, to a considerable height.

The lavanges are however not constantly so destructive every thing depends on the locality, they sometimes only form snow bridges over torrents. In the highest regions there are some which last for ages.

These snow balls are not always formed by hurricanes, they are sometimes produced in calm weather. A single stone casually tumbling from a summit is enough to cause great devastation in an instant. When the mantle of snow on the mountains begins to condense, the natives dread the least breath of wind the least vibration, they fear even the noise of the waters. The traveller dares not crack his whip. The shepherds hardly venture to breathe, they moderate the march of their flocks, and take off the bells from the necks, so much do they dread shaking the atmosphere.

In the rank of avalanches the natives place the overflowing of lakes, especially when they fall one into the other, but then the destruction is no longer partial, the whole canton is threatened.

Those lakes which are situated on the mountains at an elevation of a thousand or twelve hundred fathoms freeze early. When the surface of the lake is frozen over, it sustains the snows and icicles which perpetually keep falling into that large funnel. Here they heap up

## A V A

in a pyramidal form, and this heavy mass, when the borders of its floor melt, displacing a quantity of water equal to its enormous bulk, occasions an inundation which continues fourteen or fifteen hours, so that strangers at Brege are surprised to see in the finest summer days, the little river Bastan swell suddenly and that without any previous tempest

Thomson, in his Seasons, describes the avalanches thus

Among these hilly regions, where embrace  
In peaceful vales the happy Grisons dwell,  
Oft, rushing sudden from the lorded cliffs,  
Mountains of snow their girth ring in their roll,  
From steep to steep loud thund'ring down they come,

A wintry waste in dire commotion all,  
And herds, and flocks, and travellers and swains,  
And sometimes whole brigades of marching troops,  
Or hamlets sleeping in the dead of night,  
Are deep beneath the smothering ruin hurled  
*Winter, ver 414*

To AVA'LE, *v a* (*avaler*, Fr to let sink)  
To let fall to depress out of use (*Wotton*)

To AVA'LE *v n* To sink (*Spenser*)

AVANI, a French preposition, signifying before, or any priority either in respect of time or place, sometimes used, in composition, in our language, but more usually contracted, and wrote avant or vant, or even van

AVANIGUARD *s* (*avantgarde*, Fr) The van the first body of an army (*Mayn*)

AVANTURINI, in natural history, a yellowish stone full of sparkles, resembling gold, very common in France. An artificial imitation of it is made by mixing sparkles of copper with glass whilst it is in fusion, which is used by enamellers, and to sprinkle as sand upon writings. It may be regarded according to its composition either as a species of quartz or breccia

AVARES, or AVARI, a tribe of Sarmatian origin, denoting far distant, and formerly applied to a class of the inhabitants of the southern parts of Russia, from their dwelling farther to the east than any of the Scythian stocks

AVARICUM See BOURGES

AVATSCHA, or AWATSKA, a seaport and bay of Kamtschatka, lying 14° N lat 52° 51' and 1° E lon 138° 48'

AVARICE *s* (*avarice*, Fr) Covetousness, insatiable desire (*Dryden*)

AVARICIOUS *a* (*avaricieux*, Fr) Covetous, insatiably desirous (*Broome*)

AVARICIOUSLY *ad* (from *avaricieux*) Covetously

AVARICIOUSNESS *s* (from *avaricieux*) The quality of being covicious

AVASIA, in sea language, a term requiring to stop, or to stay

AVATAUIAS, a sect of Indian Bramins, who surpass all the rest in austerity

AVAUNCHIERS, among hunters, the second branches of a deer's horns

AVAUENT *interjct* (*avut*, Fr) A word

## A U C

of abhorrence, by which any one is driven away (*Shakspeare*)

AUBADE, in music, a concert given at daybreak in hot climates, in the open air, generally by a lover under the window of his mistress

AUBAINE, in the customs of France before the republic, a right vested in the king of being heir to a foreigner that died within his dominions, notwithstanding any testament the deceased might leave. Ambassadors were not subject to the right of aubaine

AUBE, a river of France, which rises near Auberville, in the department of the Upper Marne, passes by Ferte sur Aube, Bar sur Aube, Dienville, Arcis, &c and joins the Seine, seven miles below Mezy. It gives name to a department which it waters

AUBINAS, a town of France, in the department of the Ardèche and chief place of a canton, in the district of Orion three leagues and a half SW Privas 10° 22' 3 E lon 10° 44' 32' N

AUBENION, a town of France in the department of the Aisne and chief place of a canton, in the district of Vermin nine leagues NE Laon, and three and three quarters E Vermin

AUBIRG, a town of Germany, in the archduchy of Austria, on the north side of the Danube opposite Mintz

AUBERIVE, a town of France in the department of the Marne, and chief place of a canton in the district of Reims, on the Somme fifteen miles N Châlons

AUBERIVE a town of France, in the department of the Upper Marne, and chief place of a canton, in the district of Langres twelve miles SW Langres

AUBERIVE, a town of France in the department of the Isère, and chief place of a canton, in the district of Vienne five miles S Vienne

AUBIER, or AUBURNUM that part of the wood which is next the bark of trees, and which is softer, whiter, and more juicy than the rest (*Th iv 380*)

AUBIGNY, in geography, a town in the department of Cher, and late province of Berry in France, situated on the river Neris Lat 47° 07' N lon 2° 30' E

AUBILTIA In botany, a genus of the class and order polyandra, monogamia. Cylindrical five leaved, petioles five capsular bracts or mucronate many celled. Four species all natives of Ceylon or Guinea all tree with alternate leaves and flowers in racemes

AUBONNI a town of Bern in Switzerland Lat 46° 30' N lon 6° 50' E

AUBURN, a town of Wiltshire, with a market Tuesday Lat 51° 51' N lon 1° 32' W

AUBURNI *a* (from *auburn*, Fr) Brown, of a tan colour (*Philips*)

AUC AUGRI L the capital of the kingdom of Aden Africa Lat 9° 10' N lon 44° 55' E

AUCH a town in France in the department of Gers, 1½ the capital of Gers only Lat 43° 59' N lon 0° 40' E

## A U D

**AUCTION**, **AUCTIO**, a public sale very much in use for estates, household goods, &c. In this method of sale the highest bidder before the hammer is down is always the buyer. In some parts of Flanders it is the first bidder that is the purchaser. The auctioneer puts up the article at what he thinks the full value, and gradually lowers the sum till some person bids, and this person is the buyer. In this method, as soon as the article comes down to a fair price, a person who is desirous of becoming a purchaser is sure to bid, lest another should speak before him, and there is no bidding a second time, as at our auctions.

**To AUCTION** *v a* (from the noun) To sell by auction.

**AUCTIONARY** *a* (from *auktion*) Belonging to an auction (*Dryden*).

**AUCTIONEER** *s* (from *auktion*) The person that manages in auction. Every auctioneer must take out an annual licence, of 1/3s within the bills of mortality, and 5s qd without, besides which, duties are imposed on goods sold by auction.

**AUCTIVE** *a* (from *auctis*, 1st) Of an increasing quality.

**AUCTORARI**, in Roman antiquity, such as degraded themselves by letting themselves for money to perform in the games.

**AUCTUS**, (increased) calyx. See **CALY-CULATE**.

**AUCUBA** In botany, a genus of the class and order monocotyledon, tetrandria. Male calyx four toothed, corol four petalled, berry one-seeded. Fem. calyx four-toothed, corol four-petalled, nectaryless, root one called. The only known species is a tree native of Japan.

**AUCUPATION** *s* (*aucupatio*, Latin) Fowling, bird-catching.

**AUDACIOUS** *a* (*audacius*, 1st) Bold, impudent, daring (*Dryden*).

**AUDACIOUSLY** *ad* (from *audacious*) Boldly, impudently (*Shakespeare*).

**AUDACIOUSNESS** *s* (from *audacious*) Impudence.

**AUDACITY** *s* (from *audax*, Latin) Spirit, boldness, confidence (*Julien*).

**AUDEANISM**, the same with anthropomorphism. Audens, the chief of the Audens, obtained the name of in heretic, and the punishment of banishment, for celebrating Easter in the manner of the Jews, and attributing in human form to the Deity. He died in the country of the Goths, about the year 370. See **ANTHROPOMORPHITES**.

**AUDIBLE** (from *audibilis*, Latin) 1 That may be perceived by hearing (*Gray*). 2 Loud enough to be heard (*Bacon*).

**AUDIBLENESS** *s* (from *audibilis*) Capableness of being heard.

**AUDIBLY** *ad* (from *audibilis*) In such a manner as to be heard (*Milton*).

**AUDIENCE** *s* (*audience*, French) 1 The act of hearing or attending to any thing (*Milton*). 2 The liberty of speaking granted, or hearing (*Hobbes*). 3 An auditory, per or collected to hear (*Atterbury*). 4 The reception of any man who delivers a solemn message (*Dry*).

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**AUDIENCE** given to ambassadors, a ceremony observed in courts on the admission of ambassadors or public ministers to a hearing. In England, audience is given to ambassadors in the presence chamber, to envoys and residents, in a gallery, closet, or in any place where the king happens to be. Upon being admitted, as is the custom of all courts, they make three bows, after which they cover and sit down, but not before the king is covered and seated, and has given them the sign to put on their hats. When the king does not care to have them covered, and sit, he himself stands uncovered, which is taken as a slight.

**AUDIENCE COURT** A court belonging to the archbishop of Canterbury, of equal authority with the arches court, though inferior both in dignity and antiquity (*Cowell*).

**AUDIENTS**, or **AUDITIONALS**, in church history, an order of catechumens, consisting of those who were newly instructed in the mysteries of the church religion, and not yet admitted to baptism.

**AUDII**, a regular hearing and examining of an account, by officers appointed for that purpose. See **AUDITOR**.

**To AUDIT** *v a* (from the noun) To take an account finally (*Aruthnot*).

**AUDITION** *s* (*auditus*, 1st) Hearing.

**AUDITOR** *s* (*auditor*, Latin) 1 A hearer (*Sidney*). 2 A person employed to take an account ultimately (*Shakespeare*). The king and other great personages have auditors who examine yearly the accounts of the inferior officers, and make up from them a general book. Thus we have an auditor of the receipts, auditor of the revenue, auditors collegiate, &c.

**AUDITORY** *a* (*auditorius*, Latin) That has the power of hearing (*Newton*).

**AUDITORY** *s* (*auditorium*, Latin) 1 An audience, a collection of persons assembled to hear (*Atterbury*). 2 A place where lectures are to be heard.

**AUDITORY, AUDITORIUM**, in the ancient churches, was that part of the church where the audientes stood to hear, and be instructed. The auditorium was that part now called nave ecclesie. See **NAVE**.

**AUDITORY NERVE** See **NERVUS AUDITORIUS**.

**AUDITORY NERVES** *Nervi auditorii*. The seventh pair of nerves, which are distributed on the organ of hearing. See **PORTIO MORLIS**.

**AUDITORY PASSAGE** See **MEATUS AUDITORII EXTERNUS** and **INTERNUS**.

**AUDIRRESS** *s* A woman in that hears.

**To AVUL** *v a* To pull away.

**AVILIAN** or cross **AVILIANE**, in heraldry, a form of cross, which resembles four filberts in their husks or cases, joined together at the root end.

**AVILINO**, a town of Italy in the kingdom of Naples, and Principato Ultra, the see of a bishop, suffragan of the archbishop of Benevento. It was nearly destroyed by an earthquake, in the month of September 1694 sixteen miles S Benevento.

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**AVE-MARIA**, the angel Gabriel's salutation of the Virgin Mary, when he brought her the tidings of the incarnation—It is become a prayer or form of devotion in the Romish church. The chaplets and rosaries are divided into so many *ave-marias*, and so many paternosters, to which the members of the Romish church attribute great spiritual efficacy.

**AVENA** Oat-grass a genus of the class and order triandria, digynia. Calyx two-valved, from one to five-flowered, exterior valve of the corol with a twisted awn on the back. Thirty-four species scattered over the globe, of which seven are indigenous to our own country. The *sativa* or oat uniformly cultivated in husbandry, is a native of Chili, and bears transplanting to most countries. See **HUSBANDRY**.

**AVENA** (I at an oaten straw.) In ancient melody, a reed supposed to constitute the third kind of musical instrument used by antiquity, and succeeded that formed of the horns of quadrupeds. The first were shells. So simple was the origin of music.

**AVENAGE** *s* (of *avena*, oats, Latin.) A certain quantity of oats paid to a landlord.

**AVENCHE**, formerly the capital of Switzerland, is at present but a small town in the canton of Bern. Lat 46 50 N Lon 6 52 E.

**TO AVE'NGL** *v a* (*avenger*, Fr.) 1 To revenge (*Isaiah*). 2 To punish (*Dryden*).

**AV'NGI ANCI** *s* (from *avenger*) Punishment (*Philips*).

**AV'NGEMENT** *s* (from *avenger*) Vengeance, revenge (*Spenser*).

**AV'NGLR** *s* (from *avenger*) 1 Punisher (*Milton*). 2 Revenger, taker of vengeance (*Dryden*).

**AVENIUM FOLIUM** In botany, a veinless leaf, or one without perceptible veins.

**AVI NOR**, an officer belonging to the king's stables, who provides oats for the horses. He acts by warrant from the master of the horse.

**AVFN**, in botany. See **CARYOPHYLLATA**, and **GEUM**.

**AVENTINUS MONS**, one of the seven hills on which ancient Rome stood. The origin of the name Aventinus is uncertain, but this hill was also called *Murcius*, from *Murcia* the goddess of sloth, who had a little chapel there, and *Collis Dianæ*, from the temple of Diana, likewise *Remonius*, from *Remus*, who wanted to build the city, and who was buried there. It was taken within the compass of the city by *Anius Marcius*.

**AVENTURA**, in old writers, Tournaments. **AVENTURE** *s* (*aventure*, Fr.) A mischance, causing a man's death, without felony (*Cowell*).

**AVENUF** *s* (*avenue*, French) 1 A way by which any place may be entered (*Clarendon*).

**AVENUE**, in gardening, a walk planted on each side with trees, and leading to a house, garden gate, wood, &c. and generally terminated by some distant object. All avenues that lead to a house ought to be at least as wide as the whole front of the house, if wider they are better still, and avenues to woods and

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prospects ought not to be less than 60 feet wide. The trees should not be planted nearer to one another than 35 feet, especially if they are trees of a spreading kind, and the same ought to be the distance, if they are for a regular grove. The trees most proper for avenues with us, are the English elm, the lime, the horse-chestnut, the common chestnut, the beech, and the albe. The old method of planting avenues was with regular rows of trees, but we have now a much more magnificent way of setting the trees in clumps or plantations, making the opening much wider than before, and placing the clumps of trees at about 300 feet distance from one another.

**TO AVL'R** *v a* (*avere*, It.) To declare positively, or peremptorily (*Prior*).

**AV'ERAGI** *s* (*avragium*, It.) 1 That duty or service which the tenant is to pay to the king or other lord, by his beasts and carriages (*Chambers*). 2 A medium, a mean proportion.

**AVERAGE**, in commerce signifies the accidents and misfortunes which happen to ships and their cargoes, from the time of their loading and sailing to their return and unloading, and is divided into three kinds. 1 The simple or particular average, which consists in the extraordinary expenses incurred for the ship alone or for the merchandizes alone. Such is the loss of anchors, masts, and rigging, occasioned by the common accidents at sea, the damages which happen to merchandize by storm, prize, shipwreck, wet, or rotting, all which must be borne and paid by the thing which suffered the damage. 2 The large and common average, being those expenses incurred, and damages sustained for the common good and security both of the merchandizes and vessels, consequently to be borne by the ship and cargo and to be regulated upon the whole. Of this number are the goods or money given for the ransom of the ship and cargo, things thrown overboard for the safety of the ship, the expenses of unloading for entering into a river or harbour, and the provisions and hire of the sailors when the ship is put under an embargo. 3 The small averages, which are the expenses for towing and piloting the ship out, off, or into harbours, creeks or rivers, one-third of which must be charged to the ship, and two thirds to the cargo.

Average is more particularly used for a certain contribution that merchants make proportionably towards their losses. It also signifies a small duty which those merchants who send goods in another man's ship pay to the master for his care of them, over and above the freight. Hence it is expressed in the bill of lading, paying so much freight for the said goods with prime and average accustomed.

**AVERDUPUIS** See **AVOIRDUPUIS**.

**AVE RMENI** *s* (from *aver*) Establishment of any thing by evidence (*Bacon*).

**AVE'RNAG** *s* A sort of grape.

**AVLRNUS**, or **AVERNA** a lake of Campania near Benevento, whose waters were so unwholesome and putrid, that no birds were seen

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on its banks, hence its original name was *avops, avibus carens*. The ancients made it the entrance of hell (*Virg*)—It may be observed, that all lakes whose stagnated waters were putrid and offensive to the smell, were indiscriminately called *Averna*.

The moral suggested by Virgil's allusion to this lake as the entrance to the infernal regions, seems worth stating here.

—Facilis descensus Avernus

Sed revocare gradum, superasque cadere ad auras,

Hic labor hoc opus est

“The descent into Avernus is easy, but to recal your steps, and re-ascend to the upper skies, forms the difficulty and the labour. The poet speaks of the descent of *Aeneas* into the infernal regions. In the general application of the passage, we may say that it is much easier for a man to get into any difficulty or danger, than to extricate himself from it.

**AVERRHOA** In botany, is a genus of the class and order decandria, pentagynia. Calyx five-leaved, petals five expanding above, stamens inserted into a nectariferous ring, alternately shorter, some five-sided five-celled. Two species, both of India. They received their name from the philosopher, an account of whom is given in the next article.

**AVERRHOES, or AVERROES**, an Arabian philosopher, was a native of Corduba, and flourished in the twelfth century. He was instructed in the laws and the religion of the country by his father, who was high priest and chief judge (under the emperor of Morocco) of the kingdom of Corduba, his authority extending over all Andalusia and Valenciana. Averroes was professor in the university of Morocco, and after the death of his father succeeded to his place, the duties whereof he discharged with great approbation, being eminently skilled in law and divinity. He had also studied natural philosophy, medicine, astrology, and mathematics, but understood the theory of medicine much better than the practice. The king of Morocco making him an offer of the place of judge of Morocco and Mauritania, with leave to keep those he held at Corduba, he accepted it, went over to Morocco, and having settled judges as his subdelegates, returned to Corduba.

He referred all criminal causes to his deputy, never giving his own opinion. One Abriham Ibnu Sahal, a philosopher, physician, and astrologer, at Corduba, in an unlucky hour fell in love, and began to write verses, without any regard to his character as a doctor. The Jews, his brethren in religion, advising him not to publish them, he returned them a profane answer in verse. This obliged them to apply to the civil magistrate. They represented to **AVEROES**, that Sahal had debauched the whole city, and especially the youth of both sexes, by his poems, and that nothing else was sung at the marriage feasts. **AVEROES** forbade him to write any more, under a penalty, but being afterwards informed that his prohibition could

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not stop the poetical humour of the Jew, he resolved to be assured of the truth of it, and sent to him a trusty person, who reported at his return, that he found nobody at his house but Averroes's eldest son, writing verses, and that there was neither man, woman, nor child, at Corduba, who had not got by heart Abriham Ibnu Sahal's verses. Upon this Averroes dropped the prosecution, saying, “Can one single mind stop a thousand mouths?”

He died at Morocco in 1206. He was excessively fit, though he ate but once a day. He spent all his nights in the study of philosophy, and when he was fatigued, amused himself with reading poetry or history. Of Averroes's medicinal works himself gives the following account in the preface to them: “At the desire of the noble lord Audelach Sempac, who by the advice of his philosophers, Avicenna and Avicenna, enjoined me to write a book in Arabic, which should contain the whole art of physic, in order to assist them in forming a judgment of the opinions of the ancients, I compiled this work (*Colliget*), that is, universal, so entitled on account of the order to be observed in this science, which descends from universals to particulars. For in this book I have begun with general rules, and hereafter, with God's assistance, shall undertake another treatise upon particulars, &c.” He wrote a great many amorous verses, but when he grew old he cast them into the fire. His other poems are all lost, except a small piece, in which he declares that when he was young he acted against his reason, but that when he was in years he followed the dictates of it, upon which he utters this wish, “Would to God I had been born old, and that in my youth I had been in state of perfection.”

**AVERRORISTS**, a sect of peripatetic philosophers, who appeared in Italy some time before the restoration of learning, and attacked the immortality of the soul. They took their denomination from Averroes, and endeavoured to blend some of his whimsies with the pure doctrines of Christianity. Their principles were condemned by the last council of the Lateran under **INOCENT IX**.

**AVERRUNCATE** *a* (*averrunco*, Lat.) To root up (*Hudibras*).

**AVERRUNC**, in mythology, an order of duties, whose peculiar office it was to avert misfortunes. Apollo and Hercules were of this order among the Greeks, and Castor and Pollux among the Latins.

**AVERSION** *s* (from *aversor*, Latin) 1 Hatred, abhorrence (*South*).

**AVERSAL** *a* (*aversus*, Latin) 1 Malign, not favourable (*Dryden*). 2 Not pleased with, unwilling to (*Prior*).

**AVERSITY** *ad* (from *averse*) 1 Unwillingly. 2 Backwardly (*Brown*).

**AVERSENESS** *s* (from *averse*) Unwillingness, backwardness (*Attelrury*).

**AVERSION** *s* (*aversion*, French) 1 Hatred, dislike, detestation (*Milton*). 2 The cause of aversion (*Pope*). **AVERSION**, according to Lord Kaimes, is opposed to affection, and

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not to desire It is generally considered as synonymous with **ANTIPATHY**, which see

**À A'VERT** *v a* (*averto*, Latin) 1 To turn aside, to turn off (*Shakspeare*) 2 To cause to dislike (*Hooker*) 3 To put by, as a calamity (*Sprat*)

**AVLS**, or **BIRD'S ISLAND**, so called from the vast numbers of fowls of different species upon it It is one of the Caribbees, and lies about 100 miles north of the coast of Terra Firma

**AUF** *s* (of *alf*, Dutch) A fool, or silly fellow

**AUGEA** In botany, a genus of the class and order decurridia, monogynia Calyx five-parted corollous, nectary ten-toothed, capsule ten celled The only known species is a native of the Cape

**AUCEA**, in fabulous history, the daughter of Alæus, who was deflowered by Hercules, became pregnant and brought forth Iclephus but when she was delivered, Alæus put both Augca and her son into a chest, and ordered them to be thrown into the river Caycus, when Venus steering the chest, brought it to the mouth of the river, where it was taken up by Icuthras, who falling in love with Augca married her, and afterwards left his kingdom to Iclephus

**AUCEAS**, in fabulous history, king of Elis, particularly famed for his stable which contained three thousand oxen, and had not been cleaned for thirty years Hercules was desired to clear this stable in one day, and Augcas promised, if he performed it, to give him a tenth part of the cattle This task Hercules performed by turning the course of the river Alpheus through the stable when Augca refusing to abide by his engagement, Hercules slew him with his arrows, and gave his kingdom to Phyleus his son, who abhorred his father's iniquity

**AUGLS**, in astronomy, the same as **apsides** See **APSES**

**AUGHI** *pronoun* (*auht*, *aphz*, Saxon) Any thing (*Addison*)

**AUGIAN M S** Codex Augiensis, in biblical history, is a Greek Latin M S of the epistles of St Paul This M S is now in the second part of Wetstein's New Testament It is supposed to have been written in the 9th century, and takes its name from Augia-Major, a monastery at Rheims, to which it belonged at the time of the council of Basil It is now in the library of Trin Coll Cambridge It is defective from the beginning to Rom. iii 8, and the epistle to the Hebrews is found only in the Latin version

**AUGII**, a mineral of the chrysolite family, found in basalt, sometimes in grains, but most commonly in crystals, mostly small and complete Colour blackish green, sometimes passing into leek green, and rarely to liver brown Specific gravity 3.22 to 3.47 Before the blow-pipe it is with difficulty converted into a black enamel the constituent parts are

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Silica	52 00
Lime	13 20
Alumina	3 32
Magnesia	10 00
Oxide of iron	14 66
———— manganese	2 00
	90 19
Loss	4 81
	100 00

It is found very abundantly in Bohemia, Transylvania, Hungary, Scotland, as at Arthur's Seat, near Edinburgh, and remarkably fine in the island of Rhum one of the Hebrides and equally beautiful at Arcenal, in Norway See **CHYSOILLITE**

**À AUGMENT** *v a* (*augmenter*, Fr) To increase, to make bigger, or more (*Fausfar*)

**À AUGMENT** *v u* To increase, to grow bigger (*Dryden*)

**AUGMENT** *s* (*augmentum*, Latin) 1 Increase, quantity gained (*Walton*) 2 State of increase (*Wise man*)

**AUGMENT AUGMENTUM**, in grammar an incident of certain tenses of Greek verbs, being either the prefixing a syllable, or the increase of the quantity of the initial vowels

**AUGMENTATION** *s* (from *augment*) 1 The act of increasing or making bigger (*Addison*) 2 The state of being made bigger (*Bentley*) 3 The thing added, by which another is made bigger (*Hooker*)

*Court of Augmentation*, a court erected in the 27th year of Henry VIII to take care that the revenues of the crown were properly augmented by the estates arising from the suppression of religious houses This court was dissolved in the first year of the reign of queen Mary

**AUGMENTATION**, in heraldry additional charges to a coat armour, frequently given as particular marks of honour, and generally borne either on the escutcheon or a canton Thus all the barons of England bear the arms of Ulster in Ireland

**AUGMENTATION**, in music, a term confined to the language of fuguists, and is the doubling the value of the notes of the subject of a fugue or canon, or, the giving the intervals of the subject in notes of twice the original length

**AUGRE**, or **AWGRE**, an instrument used by carpenters and joiners to bore large round holes, and consisting of a wooden handle and an iron blade terminated at bottom with a steel bit

**AUGSBURG**, or **AUSBURG**, an imperial city of Germany, situated in a fertile and delightful country, between the rivers Lech and Wertach, which unite not far from it, it is surrounded with ramparts, walls, and ditches It is the see of a bishop, suffragan of the archbishop of Mentz Besides the cathedral, it has six Roman Catholic parish churches and as many Lutheran There are several hospi-

als, and other charitable foundations the burghers are computed to be six thousand. The magistracy consists of forty-five, of whom thirty one are patricians, four related to patricians by marriage, five merchants, and five tradesmen, the council is formed of an equal number of Lutherans and Roman Catholics. The trade of Augsburg was once very great, and is now considerable. In the diet of the empire, it possesses the second place of the imperial cities of Swabia, and is assessed in the matricula at 507 rix-dollars, twenty kruzers and a half. The bishop is a prince of the empire, and sits and votes in the college of princes, betwixt the bishops of Constance and Hildesheim, his revenue is estimated at 100,000 rix-dollars. The territory belonging to the bishopric lies scattered between the rivers Lech, Iller, and Danube. The bishop holds his court at Augsburg, but his principal residence is at Dillingen thirty five miles NW Munich. Lon 10 58 E. Lat 48 21 N.

**AUGSBURG CONFESSION**, denotes a celebrated confession of faith drawn up by Luther and Melancthon, on behalf of themselves and other ancient reformers, and presented in 1530 to the emperor Charles V. at the diet of Augusta or Augsburg, in the name of the evangelic body. This confession contains 28 chapters, of which the greatest part is employed in representing, with perspicuity and truth, the religious opinions of the protestants, and the rest in pointing out the errors and abuses that occasioned their separation from the church of Rome.

**AUGUR**, an officer among the Romans, appointed to foretell future events by the chattering, flight, and feeding of birds. There was a college or community of them consisting originally of nine members, four of whom were patricians and five plebeians.

This word is by some derived from *avis*, bird, and *garrulus*, chattering, whence the original office of the augurs is supposed to have been to observe, and take indications from the noise, calling, singing, chirping and chattering of birds. Agreeably to which, augur is commonly distinguished from *iuspex*, as the latter was supposed employed in observing the flight of birds—Pezron derives it from the Celtic *au*, liver, and *gur*, man, so that according to him an augur was properly a person who inspected the entrails, and divined by means of the liver. On which principle, augur would have been the same with *vispex*.

The augurs were at first chosen by the people divided into curie or parishes, yet we find that when any one of them died, two of the most ancient chose one of those who studied the science of augury, and presented him to the whole college, who received him after examination, and consulted an augury upon that account to know the will of the gods.

Nevertheless we have an example in Titus Livius of an augur chosen by the people, but some say it happened only because there was a contest among the augurs about the election

for it is evident that the college had right to choose till the year 651, when Marius being consul the third time, and Lucius Aurelius Orestes, Cn. Domitius Aenobarbus, tribune of the people being angry with the augurs, because they did not choose him to that dignity, caused a law to be made called *domitia*, which gave the right of choosing the augurs, chief-priest, and other priests, to the people of Rome assembled by their tribes, that it might make the greater confusion, and satisfy his own passion the more, as Cicero speaks in his 2d book of the agrarian law.

**TO AUGUR** *v n* (from *augur*) To guess, to conjecture by signs (*Dryden*).

**AUGURAI**, something relating to the augurs.

**TO AUGURAI** *v n* (*auguror*, Latin) To judge by augury.

**AUGURATION** *s* (from *augur*) The practice of augury (*Brown*).

**AUGURER** *s* (from *to augur*) The same with *augur* (*Shakespeare*).

**AUGURIAL** *a* (from *augury*) Relating to augury (*Brown*).

**AUGUROUS** *a* (from *augur*) Predicting prescient foreboding (*Chapman*).

**AUGURY**, in its proper sense the art of foretelling future events by observations taken from the chattering, singing, feeding, and flight, of birds, though it is used by some writers in a more general signification, as comprising all the different kinds of divination. Augury was a very ancient superstition. When men considered the wonderful migration of birds how they disappeared at once and appeared again at stated times, and could give no guess where they went, it was almost natural to suppose that they retired somewhere out of the sphere of this earth, and perhaps approached the ethereal regions, where they might converse with the gods, and thence be enabled to predict events. It was almost natural for a superstitious people to imagine this, at least to believe it, as soon as some impostor was impudent enough to assert it. Add to this, that the disposition in some birds to imitate the human voice, must contribute much to the confirmation of such a doctrine. Hence these animals were looked upon as the interpreters of the gods, and no affair of consequence, either of private or public concern among the Romans, was undertaken without consulting them.

The auguries which were taken from certain appearances in the air were the most considerable and solemn of all others, as not being capable to be reiterated the same day, and dissolved assemblies if a magistrate desired to prevent an assembly of the people, or put it off to another time, he would set up in the cross-ways that he observed the signs of the heavens that day, and so it was wholly put off, *alio die dixerit*.

But the senate perceiving the abuse, which that custom had brought in, ordered, that notwithstanding the enonities, an assembly



summoned in due form should not desist from sitting.

This sort of augury, which they called *augurium de cælo*, or, *servare de cælo*, was taken from extraordinary and sudden signs, which they observed in the heavens.

Now among these signs there were some called *bruta*, or *vana*, which foreshewed nothing, others were called *fructiva*, which portended good or evil, and of these last, some were called *consiliaria*, which happened when they were deliberating about any affair, and seemed to advise it, others *auctoritativa*, or *authoritative*, which came after the thing done, and confirmed or approved it.

Lastly, there were others, called *postularia*, which obliged to repeat the sacrifices, and other *monitaria*, which admonished what to avoid.

All times and every day of the year were not proper to take auguries. Plutarch tells us that Metellus, the chief priest, forbade to take auguries after the month of August, because the birds shed their feathers at that time or in any month of the year immediately after the ides, because the moon then began to decrease, or on any day after noon.

The place on which an augury was taken was a rising ground, and for that reason was called *templum*, *axis*, or *auguraculum*, according to Festus. There was a field set apart for it a little distance from Rome, called *ager effusus*, as Servius upon Virgil observes.

In the great affairs of the commonwealth, they consulted the signs of the heavens, in those of wars, the chattering and flight of birds and their manner of eating their meat, and for that end they fed poultry in coops, which they called *holi pullen*, and which they fetched commonly from the island of Lubaeri, and he that had the keeping of these poultry was called *pullarius*, saith Cicero.

The consul gave him notice, who had the care of this poultry to get all things ready to take the sign then he flung corn to the poultry, if they ate it greedily moving fast with their feet, and crowding about, this was a favourable omen but if, on the contrary, they refused to eat or drink, it was an unfortunate sign.

This is the form which they used in taking a sign. They always consulted some skilful persons in those sorts of divinations. "Quinte Fabi, te volo mihi *in auspicio esse*, or *in auspicio idhibere*, dicito si silentium, esse videtur." Quintus Fabius, I desire that you would assist me in taking a sign, tell me if all the ceremonies used in the like case have been exactly observed, and if the sign be not defective he answered, "*Silentium esse videtur*, nothing is wanting." "*Dicito, si pauciores aves?*" quare aut ubi? "*attulit in cavea pullos pullarius.*" Tell me whether the birds eat or no? They eat, and the poultry-keeper hath brought the pullus into the coop.

The veneration for auguries was so strongly imprinted on the minds of the Romans, that they looked upon them as auspicious persons

who contemned or derided them, attributing the misfortunes which happened to Claudius Pulcher to the anger of the gods, who seeing that the poultry would not eat, threw them into the sea, saying in raillery, They'll drink at least, if they will not eat.

There was a college of 300 augurs, at Lyons.

**AUGUST**, in chronology, the eighth month of our year, containing 31 days. August was dedicated to the honour of Augustus Cæsar, because, in the same month, he was created consul, thrice triumphed in Rome, subdued Egypt to the Roman empire, and terminated the civil wars.

**AUGUST**, **AUGUSTUS** *a* In a general sense, great, grand, majestic, venerable, or sacred. The title Augustus was first given by the Roman senate to Octavius on Jan 13th A U C 727 B C 27. This title, which was expressive of the character of peace and sanctity was a personal, and Caesar a family distinction.

**AUGUSTA**, the capital of Georgia, in North America is situated in a fine plain on the S W bank of the Savannah. It does not consist of more than 300 houses but is rising in importance. Lat 33 20 N Lon 82 0 W.

**AUGUSTA AUSCIORUM**, a town of Aquitania, named out of compliment to Augustus, being originally called *Cluniberium*, which name it afterwards resumed. In the middle age it took the name of the people, *Ausci*, and is now called Auch, the capital of Gascony.

**AUGUSTA I MERITA**, a town of Lusitania on the river Anis, the capital of the province a colony of the *I Meriti*, or such soldiers as had served out their legal time, were men of experience, or had received marks of favour. The colony was founded by Augustus, and is now called Merida, a city of Spain in Estramadura, on the river Guadina. See **MERIDAN**.

**AUGUSTA HISTORIA**, is the history of the Roman emperors from the time of Adrian to Carinus, that is, from the year of our Lord 117 to 285 composed by six Latin writers, A. I. Spartianus, Julius Capitolinus, A. I. Lamprius, Valerius, G. I. Trebellius Pollio, and E. I. Vopiscus.

**AUGUSTA TAURINORUM**, a town of the Taurini at the foot of the Alps, where the Duria Minor falls into the Po, now Turin, the capital of Piedmont.

**AUGUSTALIS** in Roman antiquity, an epithet given to the flame or priest appointed to sacrifice to Augustus after his deification, and also to the ludi or games celebrated in honour of the same prince on the fourth of the ides of October.

**AUGUSTALIA**, a festival instituted by the Romans in honour of Augustus Cæsar, on his return to Rome after having settled peace in Sicily, Greece, Syria, Asia and Parthia.

**AUGUSTAN**, relating to Augustus. As **Augustan age**, the age or time in which Augustus flourished. The reign of queen Anne is often called the Augustan age of England.

**AUGUSTAN CONFESSION** See AUGSBURG CONFESSION

**AUGUSTE**, or **AUSTA**, an island in the Adriatic sea, subject to Venice. Lat 42 55 N Lon 17 0 E

**AUGUSTINE** (St.), an eminent father of the church, was born at Iagaste, in Africa, in 354. His father was a plebeian, and his mother, Monica, was a woman of exemplary piety. Though he had all the advantage of a good education, he squandered away his time in idleness and debauchery. In 371 his father sent him to Carthage, where, though he still continued addicted to pleasure, he did not entirely neglect his studies. Here he became a convert to the manichæes, and continued a zealot in that way for about ten years. In 380 he taught rhetoric at Carthage with great reputation, but he still continued his licentious course of life, and kept a woman publicly, by whom he had a son, named Adeodatus. His good mother took uncommon pains to bring him back to virtue and orthodoxy, but finding all her endeavours ineffectual, she had recourse only to hope and prayer on his behalf. Wearied with his situation in Africa, Augustine removed to Rome, where he taught rhetoric with great applause, and in 383 he was appointed professor of rhetoric at Milan. Here the sermons of Ambrose, the bishop, made him stagger, and at length he totally renounced his heretical notions, and was baptized by the good bishop in 387. The next year he returned to Africa, was ordained priest in 391, and in 395 was chosen conditor to Vlerius, the bishop of Hippo, and on his death he had the sole charge of that see. He died in 430. His writings have been always held in the profoundest veneration by the catholic church, and from them was formed that system which is commonly called scholastic divinity. The best edition of his works is that of Paris, in 10 vols folio, published in 1679 and 1690.

**AUGUSTIN** (St.), the chief town of East Florida. Lat 30 10 N Lon 81 10 W

**AUGUSTINS**, or **AUGUSTINIANS**, an order of religious, thus called from St. Augustine, whose rule they observe. The Augustins, popularly also called Austin friars, were originally hermits, whom pope Alexander IV. first congregated into one body, under their general Lanfranc, in 1256. Soon after their institution this order was brought into England, where they had about thirty two houses at the time of their suppression. The Augustins are clothed in black, and make one of the four orders of mendicants. From these arose a form, under the denomination of barefoot Augustins, or Minorests, or Friars minor; there are also monks regular of St. Augustine, who are clothed in white, excepting their cope, which is black. Before the French revolution, they were known at Paris under the denomination of the monks of Gennevieve, that abbey being the head of the order. There are also nuns and choir nuns, who observe the rules of St. Augustine.

**AUGUSTINIANS** are also those divines who

maintain, on the authority of St. Augustine, that grace is effectual from its nature, absolutely and morally, and not relatively and gradually. They are divided into rigid and relaxed.

**AUGUSTINESS**, (from *august*) Elevation of look, dignity.

**AUGUSTUS** (Caius Julius Cæsar Octavianus), was the son of Cæsar Octavius, by Atia, the niece of Julius Cæsar. He was born in the year 62 B. C. and having received a liberal education, was adopted by Julius Cæsar. He was at Apollonia in Epirus when his uncle was assassinated, and, on receiving the news, he instantly set out for Rome, where he found two parties contending with each other, the republicans and the followers of Antony and Lepidus. Octavianus was treated with great respect by the magistrates and principal citizens, but Antony treated him with haughty contempt. When Antony was proscribed, he joined the army that was sent against him; but afterwards he thought it prudent to enter into a treaty with that commander, and these two leaders, together with Lepidus, formed the famous triumvirate, by which they agreed to enjoy an equal portion of authority for five years. Soon after this Octavianus ratified the malicious spirit of his associate, by withdrawing his old and excellent friend Cicerò, and, in short, the triumvir killed Rome with the blood of its best citizens. On the death of Brutus and Philippi, another partition took place, Antony and Octavianus sharing the Roman empire, and Lepidus taking to himself the provinces in Africa. Octavianus obtained Rome and gave his sister, Octavia, in marriage to Antony. At length Lepidus was deposed, and a difference broke out between Antony and Octavianus, which ended in the destruction of the former, and the establishment of the latter in that station, which seems constantly to have been his aim. In the 36th year of his age, and B. C. 27, the senate gave him the new title of Augustus, with all the power and authority of emperor. The senate paid him a flattering compliment in changing the name of the month Sextilis in which he came to the consulate to August. After attaining the imperial dignity, he seems to have corrected his eager temper, and to have conducted himself with moderation, and the sanguinary Octavianus was forgotten in the mild Augustus. He made some good regulations in the government, reducing the number of the senators from 1000 to 600, and raising the degree of wealth which was to qualify them for that dignity. He also set about reforming the public morals. Augustus carried his arms with success into Gaul, Germany, and the East, but in the latter part of his life the Romans suffered some severe losses in Germany. He died at Rome A. D. 14, and in the 76th year of his age. He certainly improved Rome considerably, and might say with justice, 'that he had found it brick, but left it marble.' He was, moreover, a great encourager of men of letters, so that his reign was called the Augustan age. The empire came to his successor, Tiberius, in a flourishing

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state, and every part of the government was in excellent order (*Watkins*)

**AUGUY-L'ANNEUT**, or **AUGILLANNEUT** See **MISLETO**

**AVIARY** s. ('rom *avis*, Lat.) A place enclosed to keep birds in ( *Evelyn*)

**AVICENNA** an Arabian physician, was born in 980. After receiving a liberal education, he applied to the study of physic, in which he attained great eminence. At the age of 19 he began to practise, and with such success, that he became physician to the court of Bagdat. At last he fell under the displeasure of the prince, in whose service he was engaged, and was thrown into prison, where he died, in 1036. He left a number of works, which were printed in Arabic at Rome in 1489, and since in Latin, in various other places. The titles of his several works are as follow: 1. Of the Utility and advantage of the Sciences in 20 books.—2. Of Innocence and Criminity, 2 books.—3. Of Health and Remedies, 18 books.—4. On the Modes of preserving Health, 3 books.—5. Canon of Physic, 14 books.—6. On Astronomical Observations, 1 book.—7. On Mathematical Sciences.—8. Of Elements, or Mathematical and Physical Demonstrations, 1 book.—9. On the Art of Living, and its Properties, 10 books.—10. On the Art of Judicium.—11. On the Elements of Logic and the Rectification of Bodies.—12. On the Land we should propose to ourselves in Travels and Philosophical Arguments.—13. Demonstration of the Colateral Lines in the Sphere.—14. Abundantia of the World.—15. On Infinity and Infinity.—16. On Physics and Metaphysics.—17. On Animals and Vegetable &c.—18. The complete works in 20 volumes.

The celebrity of this author seems to rest more upon the number of editions, than upon the production. "One would naturally expect," says Friend, (*Hist. of Physic* vol. ii. p. 23) to find in this author something new, but to the fame he acquired, but that I have very often looked into his writings, on several occasions, I could meet with little or nothing there, but what is taken from Galen or what it is copied out with a verbatim translation in Rhases or Haly Abbas.

**AVICENNIA** In botany, genus of the class polygamous in its nature. Calyx five parted, corol two lipped, the upper lip pure, capsule conical, roundish, on a stalk. Three species. India, New Zealand, Turkinque. Of the class, some consider it the plant which affords the emulsion of the plant of the pharmacopoeia. See **ASCARDIUM ORIENTALE**.

**AVIDIUS** s. (*audite* Fr.) Greediness, excessive appetite, insatiable desire.

**AVIGATO** or **AVIGATOR** **PIAR** This delicious fruit, the produce of the warm parts of Innéus, when ripe melts in the mouth like marrow, which it greatly resembles in flavour. It is supposed to be the most nutritious of all the tropical fruits, and grows in vast abundance in the West Indies and New Spain. The unripe fruit has but little

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taste, yet being very salubrious is often eaten with salt and pepper. The sailors, when they arrive at the Havannah and those parts, purchase these pears in great quantities, and chopping them into small pieces with green capsinus and a little salt, regale themselves heartily with them. They are esteemed also for their antidyenteric qualities, and are prepared in a variety of ways for the tables of the rich. See **LAURUS**.

**AVIGNON**, a city of France, in the department of Vaucluse, lately dependent on the pope with an archbishopric, and a university. Lat 43 57 N Lon 4 53 E. This is the ancient *Avenia*.

**AVIGNON BERRY**, called also French berry, is the fruit of a shrub by some authors named *hæmum*, growing plentifully near Avignon, and in other parts of France.

**AVILIA** an ancient city of Old Castile in Spain, it is seated on a high plain, surrounded with mountains. There is a good manufacture of fine cloth. Lat 40 10 N Lon 1 15 W.

**AVIS** b. d. *Avia*, birds, a name given to the second class of animals, a race of creatures infinitely diversified from the others in having the body covered with feathers, two feet and two wings for support. In the Linnean system, birds are divided into six orders, viz. accipitres, psittacines, galli, gallinæ, raptores, &c. See **SYNOPSIS**.

**AVICULUS** a (*avitus*, Lat.) Left by a nurse-maidens, ancient.

**AVIZER** a (*avir*, French) 1 To counsel (*Spenser*). 2 To betwixt himself (*Spenser*). 3 To consider (*Spenser*).

**AUKLAND**, or **BISHOP AUKLAND**, a town of Durham, having a market on Thursdays. It is 24 miles N W of London.

**AUL** is used for a court-honour by Spelman, by some of the ecclesiastical writers for the name of a church, and sometime for a court-yard.

**AULA REGIA**, or **REGIA** a formidable tribunal established by William the conqueror, in his own hall, which received appeal from all the court of the barons, and decided in the last resort on the estate, honours and lives of the barons themselves. It was wholly composed of the great officers of the crown, removable at the kings pleasure, and, having the king for president, it held the first tribunal in the kingdom under the same controul as the most august. This court underwent some regulations by the passing of the Great Charter.

**AULCLES** a town of Warwickshire, having a corn market on Tuesdays. Lat 52 16 N Lon 1 10 W.

**AULD** a (*alder* Swed.) Old (*Shakspeare*).

**AULPHEUS**, in antiquity, a flute-player.

**AULPICK** a (*aul* &c.) Belonging to pipes.

**AULIC**, an epithet given to certain officers of the empire, who compose a court, which decide without appeal in all processes entered into. Thus we say aulic council, aulic chamber, aulic counsellor. The aulic council is composed of a president, who is aulic, of twelve cham-

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cellor, presented by the archbishop of Mentz, and of eighteen counsellors, nine of whom are protestants, and nine catholics. They are divided into a bench of lawyers, and always follow the emperor's court, for which reason they are called *justitium imperatoris*, the emperor's justice and aulic council.

**AULIC** *a* (*aulicus*, Latin) Belonging to the court.

**AULN** *s* (*aulne* Fr) A French measure of length, an ell.

**AULUS GELIUS**, in biography, a Roman grammarian and critic flourished at Rome in the second century. He studied grammar and rhetoric at Rome, and philosophy at Athens, where he enjoyed the society of Calvisius Taurus, Perginrus Proteus, Herodes Atticus, and other learned persons. His "Noctes Atticae, or Attic Nights," was edited in folio at Rome, in 1469, by Leveynheim and Pannartz. There is likewise a valuable quarto edition by Gionovius, published at Amsterdam, in 1706. An elegant translation, with curious notes, was published in 3 vols. 8vo by Mr Blos, in 1793.

**TO AUMAIL** *v a* (from *maille*, Fr) To vary in figure (*Spenser*).

**AUNCLE-WEIGHT** an ancient kind of balance not out of use, being prohibited by several statutes, on account of the many deceipts practised by it. It consisted of scales hanging on hooks fastened at each end of a beam, which a man lifted up on his head. In many parts of England, auncle weight signifies meat sold by the hand without scales.

**AUNE** See **AULN**.

**AUNT** *s* (*aunte*, Fr) A father or mother's sister (*Pope*).

**AVOADO** or **ALIIGATOR PEAR**. See **LAURUS**.

**TO AVOCATE** *v a* (*avoco* Lat) To call off from business, to call away.

**AVOCATION** *s* (from *avocate*) 1 The act of calling aside (*Dryden*). 2 The business that calls (*Hale*).

**TO AVOID** *v a* (*vider*, French) 1 To shun, to decline (*Tillotson*). 2 To endeavour to shun, to shift off (*Shakspeare*). 3 To evacuate, to quit (*Bacon*). 4 To emit, to throw out (*Brown*). 5 To oppose, to hinder effect (*Bacon*).

**TO AVOID** *v n* 1 To retire (*1 Sam*). 2 To become void or vacant (*Ayliffe*).

**AVOIDABLE** *a* (from *avoid*) 1 That may be avoided or shunned (*Locke*). 2 Liable to be vacated or annulled (*Hale*).

**AVOIDANCE** *s* (from *avoid*) 1 The act of avoiding (*Watts*). 2 The course by which any thing is carried off (*Bacon*).

**AVOIDANCE**, in canon law, is when a benefice becomes void of an incumbent which happens either in fact, as by the death of the person, or in law, as by cession, deprivation, resignation, &c. In the first of these cases, the patron must take notice of the avoidance, at his peril, but in avoidance by law, the ordinary is obliged to give notice to the patron, in order to prevent a lapse.

**AVOIDER** *s* (from *avoid*) 1 The per-

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son that shuns any thing. 2 The person that carries any thing away. 3 The vessel in which things are carried away.

**AVOIDLESS** *a* (from *avoid*) Inevitable, that cannot be avoided (*Dennis*).

**AVOIRDUPOIS WEIGHT**, a weight used in England for weighing all the larger and coarser sorts of goods, as groceries, cheese, butter, flesh, wool, salt, hops, &c. and all metals except gold and silver. Avordupois weight is thus divided, viz.

16 dr or drams make	1 ounce, marked oz
16 oz	- - 1 pound, - lb
112 lb	- - 1 hundred weight, cwt
20 cwt	- - 1 ton

The avordupois ounce is less than the troy ounce, in the proportion of 70 to 708, but the avordupois pound greater than the troy pound in the proportion of 700 to 576.

for 1 lb avoird is = 7000 grains troy,  
but 1 lb troy is = 5760 grains troy,  
also 1 oz avoird is = 437½ grains troy,  
and 1 oz troy is = 480 grains troy.

The first statute that directs the use of the avordupois weight is that of 24 Henry VIII which plainly implies it was no legal weight till sanctioned by that statute, the particular use to which the said weight is thus directed, is simply for weighing butcher's meat in the market. After this it gradually grew into general use, for weighing such goods as are very coarse and drossy, or subject to waste.

**AVOIACTION** *s* (from *avolo* I) The act of flying away, flight (*Brown*).

**AVON**, a river which rises in Wiltshire and passes through Salisbury a little below which it begins to be navigable, it continues its course to Bristol and falls into the Severn a few miles N. W. of that city.

**AVON**, a river which rises in Leicestershire and running S. W. by Warwick, continues its course by Lichfield and falls into the Severn at Leicestershire, in Gloucestershire.

**AVORET** See **RECURVIFROSTRA**.

**TO AVOUCH** *v a* (*avouer*, French) 1 To affirm, to maintain (*Hooker*). 2 To produce in favour of another (*Spenser*). 3 To vindicate, to justify (*Shakspeare*).

**AVOUCH** *s* (from the verb) Declaration, evidence, testimony (*Shakspeare*).

**AVOUCHABLE** *a* (from *avouch*) That may be avouched.

**AVOUCHER** *s* (from *avouch*) He that avouches.

**TO AVOW** *v a* (*avouer* Fr) To declare with confidence, to justify (*Swift*).

**AVOWABLE** *a* (from *avow*) That may be openly declared.

**AVOWAL** *s* (from *avow*) Justificatory declaration, open declaration.

**AVOWFDLY** *ad* (from *avow*) In an open manner (*Clarendon*).

**AVOWLL** *s* (*avoue* Fr) He to whom the right of advowson of any church belongs.

**AVOWER** *s* (from *avow*) He that avows or justifies (*Dryden*).

**AVOWRY**, in law, is where a person de-

strained sues out a replevin, for then the distrainer must vow, and justify his plea, which called his avowry

**AVOWSAL** *s* (from *avow*) A Confession

**AVOWTRY** *s* (See **ADVOWTRY**) Adultery

**AVOYER**, in ecclesiastical antiquity, the advocate of a monastery

**AUR** (*aura*, *aveo*, from *eo*, to breathe, or rather from *aur*, Heb light ether, or any other exquisitely attenuated gas) Any subtle vapour or exhalation

**AURA**, in chemistry, a name anciently employed to denote a substance nearly similar to spiritus rector, or aroma

**AURÆ**, in mythology, a name given by the Romans to the nymphs of the air. They are mostly to be found in the ancient paintings of ceilings, where they are represented as light and airy, generally with long robes and flying veils of some lively colour or other, and fluttering about in the rare and pleasing element assigned to them

**AURA EPILEPTICA** A sensation which is felt by epileptic patients, as if a blast of cold air a rised from the lower parts towards the heart and head

**AURA SEMINIS** In old and perhaps erroneous physiology, the extremely subtle and vivifying portion of the semen virile that ascends through the Fallopian tubes, to impregnate the ovum in the ovium

**AURANCHES**, in ancient town of France, the department of the Charente and its province of Normandy Lat 48 41 N Lon 1 18 W

**AURANGIUM** See **AURANTIUM**

**AURANTIA CORTEX**, in pharmacy Orange peel

**AURANTIUM**, (*aurantium*, ab a reo colore, from its golden colour) Aurantium hispalense The Seville orange The plant which affords this fruit is the *citrus aurantium*, petiolis dilatis, foliis acuminatis, of Linnæus Class polyadelphia Order icosandra The leaves, flowers, and exterior rind are directed for medicinal use The latter possesses stomachic and stimulant qualities, and is ordered in tinctures, conserves, and syrups the leaves and flowers are very seldom used See **CITRUS**

**AURIALI XANDRINA** in pharmacy, a kind of opiate, or antidote against the cholera and apoplexy, composed of a great number of ingredients, which was in great fame among the ancient writers. It is called *aurea* from the gold (*aurum*) which is an ingredient in its composition, and alexandrina, as having been invented by a physician named Alexander

**AURELIA** The chrysalis or quiescent stage of transformation in an insect, in which it is inclosed in a hard case or web

**AURELIAN** emperor of Rome after Flavius Claudius, was austere, and even cruel in the execution of the laws, and punished his soldiers with uncommon severity He rendered himself famous for his military character, and his expedition against Zenobia, the celebrated queen of Palmyra, gained him great honours

He beautified Rome, was charitable to the poor, and the author of many salutary laws He was naturally brave, and in all the battles he fought, it is said he killed no less than 800 men with his own hand In his triumph, he exhibited to the Romans people of 15 different nations, all of which he had conquered He was the first emperor who wore a diadem After a glorious reign of six years, as he marched against the northern barbarians, he was assassinated near Byzantium, A D 275 29th January, by his soldiers, whom Mnestheus had incited to rebellion against their emperor

As to the general character of Aurilian, it has been remarked by Dioctesian, that his talents were better suited to the command of an army than to the government of an empire His temper was haughty and vindictive, and he was extremely impatient under restraint or contradiction He has been classed among the persecutors of the christian church, his persecution being reckoned by Augustine, the ninth Moseheim however, is of opinion that many Christians did not suffer at this time, but considering Aurelian's cruel temper, and how much he was addicted to the Gentile superstitions, he thinks that if he had lived, his persecutions would have exceeded all the former ones in severity

**AURINGABAD**, a city in the East Indies, capital of the province of Balagat Lat 20 10 N Lon 76 50 E

**AUREOLA**, in its original signification, denotes a jewel which is proposed as a reward of victory in some public dispute Hence the Roman schoolmen applied it to denote the reward bestowed on martyrs, virgins, and doctors, on account of their works of supererogation, and painters use it to signify the crown of glory with which they adorn the heads of saints, confessors &c

**AURLUS**, a Roman gold coin, equal in value to twenty-five denarii According to Ainsworth, the value of the higher empire weighed near five pennyweights, and in the lower empire little more than half that weight

**AURUS**, in zoology, the species of canis usually called the jackal

**AURICHALFUM**, a corruption of **ORICHALCUM**, which see

**AURICLE**, **AURICULA**, in anatomy, the external ear, or that part of the ear which is prominent from the head The word is a diminutive of *auris*, ear, little ear For the structure and variety of the auricle, with the several parts thereof, their names &c see **EAR**

**AURICLE** is also applied to two appendages of the heart, being two muscular caps, covering the two ventricles thereof, thus called from the resemblance they bear to the external ear See **ANATOMY** and **HEART**

**AURICOLA** (from *aurum*, gold, and *καλλω*, to glue together, a barbarous and unclassical term compounded of two languages) Borax a substance with which goldsmiths solder gold. Chrysocolli

**AURICULA**, (*auricula*, dim of *auris*, the ear) The external ear, upon which are several

eminences and depressions, as the helix, antihelix, tragus, antitragus, concha auricula, scapha, and lobulus

**AURICULA JUDÆ** Fungus sambucinus A membraceous fungus, the pezziza auricula, concava rugosa auriformis, of Linnæus, which resembles the human ear. Its virtues are adstringent, and it is generally employed in form of decoction, as a gargle for relaxed sore throats

**AURICULA MURIS** See PILOSELIA

**AURICULA**, borage leaved See VERBASCUM

**AURICULAR** *a* (from *auricula* Lt) 1 Within the sense or reach of hearing (*Shakespeare*) 2 Secret, told in the ear 3 Traditional, known by report (*Bacon*)

**AURICULARIS**, (*auricula* is, *auris*, from *auris*, the ear) The little finger is called because people generally put it into the ear, when the hearing is obstructed

**AURICULATE** See LATID

**AURICULARLY** *ad auriculam* )

In a secret manner (*Duncan of Perth*)

**AURIFEROUS** *a* (*aurifer*, Linn) That produces gold (*Thomson*)

**AURIFLAMMA**, in the French history a standard belonging to the abbey of St Denis, suspended over the tomb of that saint, which the religious, on occasion of any war in defence of their lands or rights, took down with great ceremony, and gave it to their protector or advocate, to be borne at the head of the forces. Hence the word is sometime used to denote the chief flag or standard of an army

**AURIGA**, the waggoner, in astronomy, a constellation of the northern hemisphere, it contains, according to the best account, 40 stars of the first six magnitudes, namely 1119 stars arranged according to their magnitude

**AURIGARI, AURIGÆ, AURIGÆ-TORÆ** Coachmen, who in the public plays of the Cirque disputed with the competitors, with whom they contended in driving the chariots for the prizes which were proposed. They made up certain societies, distinguished by colours, of which we read the four principal in Gruter's Inscriptions, viz *Russatam*, the red *Prasinam*, the green *Tenetan*, the blue, and *Allatam*, the white. The ancients thought that the four seasons of the year were presented by them

**AURIGATION** *s* (*auriga* Latin) The act or practice of driving carriages

**AURIPIGMENTUM** Yellow ointment See ARSENIC

**AURIS**, (*auris*, from *aura*, air, as being the medium of hearing) The ear, or organ of hearing. See EAR

**AURISCAIP**, (*auriscapum*, from *auris*, the ear and *scapo*, to scrape) An instrument for cleansing the ear

**AUPITÆ**, in ancient history, the denomination of a large body of adventurers who migrated into Egypt at a very early period. Vinnetho supposes them to have been Arabians, but the learned Bryant maintains that they were Arctæ, who had been expelled from Babylon by the sons of Shem, at the second dispersion

**AURORA**, in fabulous history, the daughter of Hyperion and Thea. The poets have feigned her to be the day break, which gives notice of the approach of the sun. This, by the poets has been represented in the most beautiful manner, particularly by Homer and Virgil, who represented Aurora as rising out of the ocean in a saffron-coloured robe, and seated in a flame coloured chariot, drawn by two or four horses with her rosy fingers opening the gates of light and scattering the purple dews. The goddess is said to have been enamoured with a beautiful youth named Cepheus, who is supposed to be the same with the Sun, and by whom she had Phœton, her greatest favourite however. Tithonus, to whom she bore Aëthion and Menon, she had also in common with Orion, though as this was her husband, who was one of the Titans, and by whom she had the stars, and the four winds, Zephyrus, Æolus, Boreas, and Eurus

**AURORA** applies, first to morning twilight, or that faint light which appears in the morning when the sun is within 18 degrees of the horizon

**AURORAE CREATIS, NORTHERN LIGHT, or STREAMERS**, a kind of meteor appearing in the northern part of the heaven, mostly in the winter season and in fine weather. It is usually of a reddish colour, inclining to yellow, and sends out frequent eruptions of pale light which seem to issue from the horizon in a pyramidal unbroken form and shooting with great velocity up to the zenith. It appears often in form of an arch which is partly bright, and partly dull, but generally transparent. And the most of it is not found to have any effect on the rays of sunlight which pass freely through it. This curious phenomenon has been regarded by poets as well as philosophers and Thomson has described it with much beauty and accuracy in his Seasons

“ Silent from the north,  
A blaze of meteors shoots, encompassing first  
The tower slack, the all at once convect  
High to the crown of Heaven, and all at once  
Relapsing quick, is quickly re-extend  
And mix and thwart, extinguish and renew,  
All a her coursing in a maze of light”

This kind of light never appears near the equator, and for some time past, that none are recorded in our islands since that remarkable one, Nov. 6, 1703, till the surprising aurora borealis, March 6, 1716, which appeared for three nights successively, but by far more strongly on the first—Indeed in the years 1707, and 1708, five small ones were observed in less more than eighteen months

Butcher Boscovich has determined the height of an aurora borealis, observed on the 16th of December 1737, by the marquis of Poleni, to have been 82 miles and Mr Boscovich from various of his computations makes the average height of the aurora borealis to be 2 Swedish or (supposing a Swedish mile to be about 6½ English miles) 408 English miles.

## AURORA BOREALIS.

Puler supposes the height to be several thousands of miles, and Mairan also assigns to these phenomenon a very elevated region, the far greater number of them being, according to him, about 200 leagues above the surface of the earth. Dr Blagden, speaking of the height of some fiery meteors (*Phil Trans* vol lxxiv p 227) says that "the aurora borealis appears to occupy as high, if not a higher region, above the surface of the earth, as may be judged from the very distant countries to which it has been visible at the same time." He adds, that "the great accumulation of electric matter seems to lie beyond the verge of our atmosphere as ascertained by the cessation of twilight." However the height of these meteors, none of which appear to have ascended so high as 100 miles, is trivial, compared with the elevations above ascribed to the aurora borealis. But as it is difficult to make such observations on this phenomenon is so difficult to afford a just estimate of its altitude they must be subject to considerable variation and to material error.

This kind of meteor is, in the polar regions, almost constant during the winter and appears with great lustre. In the Shetland Isles the "merny dancers," as they are there called, i.e. the constant admissions of clear evenings, and afford great relief amidst the gloom of the long winter nights.

In the northern latitudes of Sweden and Lapland the aurora borealis are not only singularly beautiful in their appearance, but, by their almost constant effulgence, afford travellers a very beautiful light during the whole night. In Hudson's Bay the aurora borealis displays a varied splendour, which is said to equal that of the full moon. In the north-eastern parts of Siberia, according to the description of Gmelin, these northern lights are observed to begin with single bright pillars, rising in the north, and almost at the same time in the north east, which gradually increasing comprehend a large space of the heavens, rush about from place to place with incredible velocity, and finally almost cover the whole sky up to the zenith, and produce an appearance as if a vast tent were expanded in the heavens glittering with gold, rubies, and sulphur. The illumination is attended with a humming and crackling noise through the air as though the largest fire works were playing off similar lights, called aurora australes, have been long since observed towards the south pole (*See Phil Trans* No 401, &c), and their existence has been more lately ascertained by Mr Foster, who assures us that, in his voyage round the world with captain Cook, he observed them in high southern latitudes.

Many attempts have been made to determine the cause of this phenomenon. Dr Halley imagines that the watery vapours or effluvia, exceedingly rarefied by subterraneous fire, and tinged with sulphurous streams, which many naturalists have supposed to be the cause of earthquakes, may also be the cause of this appearance, or that it is produced by a kind of subtle matter freely pervading the pores

of the earth, and which, entering into it nearer the southern pole, passes out again with some force into the æther, at the same distance from the northern. This subtle matter by becoming more dense, or having its velocity increased, may perhaps be capable of producing a small degree of light, after the manner of effluvia from electric bodies, which, by a strong and quick friction, emit light in the dark, to which sort of light this seems to have a great affinity. *Philos Trans* No 347. See also Mr Cotes's description of this phenomenon, and his method of explaining it by streams emitted from the heterogeneous and fermenting vapours of the atmosphere in Smith's Optics, p 69.

Mr Canan, soon after he had obtained electricity from the clouds, offered a conjecture that the aurora is occasioned by the dashing of electric fire positive towards negative clouds at a great distance, through the upper part of the atmosphere, where the resistance is least and he supposes that the aurora which happens at the time when the magnetic needle is disturbed by the heat of the earth is the electricity of the heated air above it and this appears chiefly in the northern regions, as the alteration in the heat of the air in those parts is the greatest.

Sig Becerra conjectures that there is a constant and regular circulation of the electric fluid from north to south, and he thinks that the aurora borealis may be this electric matter performing its circulation in such a state of the atmosphere as renders it visible, or approaching nearer than usual to the earth though probably this is not the mode of its operation, as the meteor is observed in the southern hemisphere with the same appearances as in the northern. Dr Franklin supposes that the electric fire discharged into the polar regions, from many leagues of vaporised air rised from the ocean between the tropics, accounts for the aurora borealis and that it appears first where it is first in motion, namely in the most northern part, and the appearance proceeds southward, though the fire really moves northward. *Franklin's Exper and Obs* 1769, p 49. *Philos Trans* vol lvi p 358, 784, 1b vol li p 403, *Lectures dell Electricismo*, p 269, or *Priestley's Hist of Electricity*.

Mr Libes has suggested a new theory in his *Nouv Diet de Physique*, which is adopted by most of the northern philosophers. In Libes's opinion electrical light is not the cause of the aurora borealis, nor has electricity itself any farther influence upon their existence than as it fixes the terrestrial substances whose combination occasions the meteor. This philosopher's theory is founded upon the following principles.

- 1 If we excite the electric spark in a mixture of azotic and oxygen gas, there will result nitric acid, nitrous acid, or nitrous gas, according to the relation that subsists between the gases which compose the mixture.

- 2 Nitric acid, when exposed to the sun, assumes more colour and volatility. Scheele first observed this phenomenon. Libes placed a receiver over a salver containing nitric acid and exposed to the action of the solar rays



# AURORA BOREALIS.

Some minutes after, the acid appeared coloured, and the receiver filled with red and volatile vapours, which were sustained in it a long while, and diffused a light similar to that of the auro borealis

3 In flasks which contain nitrous acid, a ruddy and volatile vapour is always perceived above the vapour

4 Nitrous gas, in contact with atmospheric air, exhales ruddy vapours, which fly off into the atmosphere

5 The hydrogen, which is disengaged from the surface of the globe, rises till it occupies in the higher regions of the atmosphere a place determined by its specific gravity

6 The solar heat has very little activity in the polar regions

These several principles rest upon observations and experiment made with the greatest exactness, and most of them too well known to need being described here. Now it is manifest from a simple combination of these facts 1st That the production of hydrogen must be almost nothing in the polar regions 2dly That the higher regions of the polar atmosphere contain very little if any hydrogen 3dly That whenever there is a re establishment of equilibrium of the electric fluid in the polar atmosphere, this fluid can only find in its passage a mixture of azot and oxygen 4thly That the electric spark ought to fix and combine these gaseous substances 5thly That from this combination must result a production of nitrous acid, of nitric acid, or of nitrous gas, according to the relation subsisting between the oxygen and azot that constitute the mixture 6thly That the production of either of these acids, or of the gas, will give birth to red and volatile vapours, whose elevation in the atmosphere will form the meteor known under the name of the aurora borealis

After removing some general objections to these preliminary notions, M. Lavoisier applies them to the phenomenon, as below

1st Phenomenon The aurora borealis are sometimes accompanied by slight detonations

In the polar regions, the production of hydrogen is next to nothing, by reason of the little activity of the solar heat. It is nevertheless true, that in summer the long duration of the sun above the horizon causes even there a heat sufficiently considerable to produce the disengagement of some small portion of hydrogen, which will rise up to the higher regions of the atmosphere, whence it results, that if the re establishment of equilibrium of the electric fluid takes place in the polar atmosphere, when its superior strata contain this gaseous substance the electric spark must exert upon it a part of its activity, and produce slight detonations

2d Phenomenon The major part of aurora boreales appear to move from the north towards the south, though some are seen whose motion is directed towards the east or west

The nitric acid, nitrous acid, and nitrous gas, which give birth to aurora boreales, have their origin towards the poles. These sub-

stances exhale ruddy vapours, which, as they rise in the atmosphere, must direct their motion towards the place where they meet with least resistance, which is, of course, towards the south, where the air, always less dense than about the north, offers them a more free and easy passage. It may also happen that at the same time these ruddy vapours are impelled, a northerly wind may blow in the upper region of the atmosphere, and thus give them a strong impulsion which, combined with the previous general tendency so upward, may cause the resulting motion to be sometimes southward, at others eastward, or westward

3d Phenomenon The aurora borealis sometimes exhibit themselves under the form of luminous columns having different figures and different directions. Some are cylindrical, others pyramidal, others are curved in the shape of an arc. When they are impelled with much activity, they proceed to the zenith of the spectator. The motion is still more rapid, go on beyond the zenith sometimes even till they reach the southern horizon. They do not always rise directly from the centre of the cloudy part towards the zenith, but sometimes take a lateral direction, especially when the cloud from whence they spring is found suspended between the north and the east or west

When the re establishment of equilibrium of the electric fluid fixes and combines a great quantity of azote and oxygen the ruddy vapours resulting from this combination must occupy a large space in the atmosphere. These vapours being of such considerable extent, and impelled from north to south must sometimes separate from one another, the different portions receiving various directions, thus they will be carried sometimes perpendicularly, at others parallel to the horizon, at others parallel to the earth's axis, whence it follows that the aurora borealis must sometimes appear to the observer in the form of columns whose number, figure, and direction, are determined by circumstances. It may also sometimes happen that these luminous columns remain for a time immovable, with respect to the horizon. This ought to be the case whenever a wind impels the luminous cloud towards any part whatever from the south, with the same force as the exhalations are impelled towards it by a contrary wind

4th Phenomenon The aurora boreales do not all shine with an equally vivid lustre, some have a mild and tranquil light, others shine with a very resplendent brilliancy

The vapours which are disengaged from nitric acid exposed to the solar rays, diffuse a mild light of a clear red, verging towards yellow, those which are perceived above them, from nitrous acid, are of a deep red; those exhaled from the nitrous gas, in contact with the atmospheric air, are at first of a pretty deep red, which afterwards become more and more clear and light, as these vapours extend themselves more in the atmosphere. The luminous columns, therefore, presented by the aurora

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borealis, have different colours, according as the ruddy vapours take their rise from the formation of the nitric acid, of the nitrous acid, or of the nitrous gas. Retrospect of Philosophy, &c Discoveries, No 8

Our ingenious countryman, Mr Dalton, is of opinion that the aurora borealis is a magnetic phenomenon, the beams being governed by the earth's magnetism. See his Meteorological Essays, or Gregory's Astron and Philos. Reasons

**AURORA ISLAND**, one of the New Hebrides, in the South Pacific Ocean, about twenty leagues in circumference, with a small bay on the north-west coast, with plenty of fresh water and wood. Lon 168 12 E Greenwich Lat 8 S

**AURUM** Gold. A metal of a reddish-yellow colour, not tarnished by the air, softish and very malleable, not sonorous, exceedingly malleable and ductile, specific gravity 19 300 burning in a red heat with a sea-green light, and melting at a white heat soluble only in nitro muriatic acid, and giving the solution a yellow colour, when melted with borax producing a ruby coloured glass. Twelve species, the following are the chief

1 **Auratum** Native gold. Not combined with other minerals, very ponderous, ductile, visible in its matrix. Found in the sand of a stream flowing from mount Grogan near Aghow, in the county of Wicklow Ireland, in Cornwall and Scotland, in the mines of Peru and Chili, New Spain, Java, Siberia, Transylvania, Spain, Hungary, France, and most countries of Europe, generally near the surface or mixed with sand in the beds of rivers. It is rarely found quite pure, but almost always mixt with silver, copper, or other substances, giving more or less variation to its appearance or colour. Its form is generally common, or imbedded in its matrix in various shapes. In its crystallized shape it is usually in small aggregate six-sided tables, with a right angled four sided prism ending in a point or terminating at each end by an imperfect four sided prism in cubes, or simple three-sided, or double four sided pyramids. It has no perceptible taste or smell, and does not alter or lose its lustre by any exposure to air or water. Its malleability is such that one grain of gold may be reduced to cover 564 square inches so ductile is it that in ounce of gold upon silver wire is capable of being extended more than 1800 miles, and so great is its tenacity that a gold wire  $\frac{1}{8}$  inch in diameter is able to support a weight of 15,007 pounds avoirdupois without breaking. The largest lump of native gold ever known was brought from Wicklow, and weighed 22 ounces and contained in 24 parts fine gold  $21\frac{1}{2}$ , fine silver  $1\frac{1}{2}$ , and copper and iron alloy 0 $\frac{1}{2}$

2 **Aurinarium** Sand gold, combined with grains or particles of sand or other substances, and giving them a golden splendour. Found in many rivers of South America and the adjacent islands, in Africa, Arabia, India, and many parts of Europe

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3 **A argentiferum** Argentiferous gold, of a pale yellow colour, lighter than fine gold. Found in most gold mines, sometimes combined with nearly a fourth part of silver. They may be separated by a digestion with nitric acid, which takes up the silver and leaves the gold behind

4 **A pyriticum** Gold pyrites of a gold yellow colour, emitting sulphurous flames when made hot. Found in the gold mines of Sumatra, New Spain, Hungary, Sweden and Transylvania, sometimes in a crystallized form. Yields frequently from 30 to 40 ounces of gold in a hundred pounds weight

**Aurum Potabile**, potable gold, is a liquid preparation of the metal formerly much used in medicine, but now entirely obsolete

**Aurum Fulminans**, or **Fulminating Gold**, is a substance compounded of ammonia and oxyd of gold, which is of a dull brown or yellow colour, and, when heated, explodes with considerable violence. It is usually exploded by a very gentle heat, in a shovel, but sometimes it requires the heat to be much increased, and if it be touched before it takes fire, or the smallest degree of friction be applied, the explosion is immediately brought on. The gold is reduced to its metallic state, and, if it be exploded upon paper, a stain is observed of minute particles of gold. This experiment is frequently attended with danger, arising from the use of too much heat, from friction, from bruising, with warm water, in a mortar, &c

There are several other compounds which possess the property of violent detonation. A list of them may be found under the article **FULMINATING SUBSTANCES**

**Aurum musivum musicum**, or **mosaicum**, is a substance formed by heating gradually in a retort, equal parts of white oxide of tin and sulphur. It is composed of 60 parts of the former, and 40 of the latter—whence its more appropriate name sulphuretted oxide of tin. It consists of beautiful gold coloured flakes, exceedingly light, which adhere to the skin. It has no taste, and is insoluble in water, acids, or liquid alkalis. It is used as a pigment, and is also mixed with melted glass to imitate the sparkling of lapis lazuli

**Aurum paradoxicum, problematicum, graphicum**, are ores of gold and of tellurium

**Aurum Sophisticum**, mimic gold, is a preparation made of fine distilled verdigris, 8 ounces, crude alexandrian tutty 4 ounces, nitre 1 $\frac{1}{2}$  ounce, these, pulverized and mixed together with oil to the consistence of a plaster, are to be put into a red hot German crucible, which is then to be covered, and the furnace filled with coals over the crucible. When the mass is melted and cooled and the crucible broken, a fine substance resembling gold, and weighing about 4 ounces, will be found at the bottom, which being malleable may be wrought into any form

**AURUNGABAD** See **AURENABAD**

**AUSI**, an ancient and very savage people of Libya. They celebrated a feast annually in honour of Minerva, in which the girls divided

into two companies, fought with sticks and stones, and those who died of their wounds were concluded not to have been virgins

**AUSIPÆ**, or **ÆSIPÆ**, a tribe of ancient Arabs, supposed by Bochart to have inhabited the land of Uz mentioned in scripture

**AUSONIUS** (in Latin *Decius*, or rather *Decimus*, Mignus Ausonius), one of the best poets of the fourth century, was the son of an eminent physician, and born at Bourdeaux. Great care was taken of his education, the whole family interesting themselves in it, either because his genius was very promising, or that the scheme of his nativity, which had been cast by his grandfather on the mother's side, made them imagine that he would rise to great honour. He made an uncommon progress in classical learning, and at the age of thirty was chosen to teach grammar at Bourdeaux. He was promoted some time after to be professor of rhetoric, in which office he acquired so great a reputation, that he was sent for to court to be preceptor to Gratian, the emperor Valentinian's son. The rewards and honours conferred on him for the faithful discharge of his office prove the truth of Juvenal's maxim, that when fortune pleases she can raise a man from a rhetorician to the dignity of a consul. He was actually appointed consul by the emperor Gratian, in the year 379, after having filled other considerable posts, for, besides the dignity of quæstor, to which he had been nominated by Valentinian, he was made prefect of the Prætorium in Italy and Gaul, after that prince's death. His speech, returning thanks to Gratian on his promotion to the consulship is highly commended. The time of his death is uncertain, he was still living in 392, and lived to a great age. The emperor Theodosius had a great esteem for Ausonius, and pressed him to publish his poems. There is a great inequality in his work, and in his manners and his style there is a harshness which was perhaps rather the defect of the times he lived in, than of his genius. Had he lived in Augustus's reign, his verses, according to good judges, would have equalled the most finished of that age. He is generally supposed to have been a Christian, some ingenious authors indeed think otherwise, but, according to Mr Baile, without just reason. The best edition of his poems is that of Amsterdam, in 1671.

**AUSPEX**, a name originally given to those who were afterwards denominated *augurs*. In which sense the word is supposed to be formed from *avis*, bird, and *inspicere*, to inspect, *auspices*, q. d. *auspices*. Some will therefore have *auspices* properly to denote those who foretold future events from the sight of birds.

**AUSPICE** *s* (*auspicium*, Lat.) 1 The omens of any future undertaking drawn from birds. 2 Protection, favour shown (*B Jon-*

**AUSPICIOUS** *a* That which promises favourable, fortunate, kind, propitious to persons

**AUSPICIOUSLY** *ad* In such a manner as to command success

**AUSPICIUM**, nearly the same with **AUGURY**

**AUSTER**, one of the four cardinal winds, as Servius calls them, blowing from the south

**AUSTERAL** *a* (*austerus*, Lat.) 1 Severe, harsh, rigid (*Rogers*) 2 Sour of taste, harsh (*Blackmore*)

**AUSTERE**, (*austerus*, from *auo*, to turn) 1 Rough astringent taste

**AUSTEREITY** *ad* (from *quætere*) Severely, rigidly (*Milton*)

**AUSTERINNESS** *s* (from *austere*) 1 Severity, strictness, rigour (*Shaks*) 2 Roughness in taste

**AUSTERITY** *s* (from *austere*) 1 Severity, mortified life, strictness (*Idem*) 2 Cruelty, harsh discipline (*Not common*)

**AUSTRIUM**, or **BLATKOW**, a town of Moravia in the circle of Brunn, it was almost destroyed by the Swedes in the 17th century twelve miles ESE Brunn, and 112 ESE Prague

**AUSTILST**, or **ST AUSTEL**, a market and stannary town of Cornwall in England. In its immediate vicinity are some valuable tin mines, and at the west end of the town are three blowing houses, where the tin is separated from the ore by means of fire.

**AUSTRIAL** *a* (*austrius*, Lat.) Southern

**AUSTRIALIS CORONA** and **PISCIS** the Corona and Piscis

**AUSTRIALIA** in geography, a name given to those countries that lie to the south of Asia, is New Holland, New Guinea, New Zealand &c.

*To* **AUSTRALIZE** *v n* (from *auster*, Lat.) To tend toward the south (*Brown*)

**AUSTRIUM** *a* (*austrinus*, Lat.) Southern

**AUSTRIA** (archduchy of), a country of Germany, bounded on the north by Bohemia and Moravia, on the east by Hungary, on the south by Stiria, and on the west by the archbishopric of Salzburg, the river Enns divides it into Upper and Lower Austria. Vienna is the capital of the latter, and Linz of the former, the whole six hundred and thirty seven thousand square mile, and in the year 1784 the number of the inhabitants was one million five hundred and eighty-two thousand, three hundred and ninety-five. It exceeds all other provinces of Germany in the fertility of its soil, abundance of its produce, salubrity of the air, and beauty of the country, grain, wine, and fruit, every where abound, the saffron is superior to that of India. The inhabitants are polished, intelligent, and warlike. Austria was erected into a marquisate by the emperor Otto I and into a duchy by Frederick Barbarossa. The emperor Rodolphus, of the house of Hapsburg, seized Austria from Otto IV, King of Bohemia, who was slain in a battle near Vienna. This emperor laid the foundation of the grandeur of the present house of Austria, from which most emperors have since been chosen. Austria was then erected into an archduchy with great privileges. The cir-

[illegible]

**AUSTROROMANCY**, South-lying.

**AUTRORPOIN**, in law, is when a person's  
property is in another's right, is a co-  
tenancy.

At the same time, we acknowledge that we have not yet found a way to make the clothing more comfortable in all its forms. We will continue to work on this, and we will be sure to give you the best possible results. We will be sure to give you the best possible results.

"We are glad to find Dr. Watson has  
 published the difference between their  
 manuscript and their printed history. A man  
 would think that such was written by the  
 person whose name bears the author of  
 it. Another book, that which led to  
 further effect, if they really happened. A  
 book is to be true without being with  
 it, and a book is to be authentic without  
 being genuine. The books written by Ri-  
 chardson and Hall are genuine books,  
 though the histories of Clarendon and Le-  
 Jones are fables. The history of the island  
 of Ceylon is a genuine book, it was written  
 by P. de la Cour, but it is not an authen-  
 tic book (though it was long esteemed as such),  
 for the author, in the latter part of his life,  
 took shame to himself for having imposed  
 on the world, and confessed that it was mere  
 romance. Anson's voyage is to be considered  
 as an authentic book, it probably contains a  
 true narration of the principal events recorded  
 in it, but it is not a genuine book, since it  
 was not written by Walter, of whom it is  
 subscribed, but by Robin. This distinction is  
 judiciously applied to the present 'Annals' by the  
 authenticity of the principal facts by Dr.  
 Watson in his second letter of his 'Apology  
 for the Bible' in reply to Paines Age of  
 Reason.

AU THENTIC AU THENTIC *(Male)*  
 AUTHENTIC AUTHENTIC *(from authentic)* With all the circumstances requisite to  
 procure authority *(South)*

AUTHENTIC ALNESS s (from *authen.*

## A U T

**AUTHENTICITY** : (from *authentich*)  
Authority, genuineness

ALUTH NICK KLY *ad* (from *authentick*)

After in authentic manner  
AUTHENTIC KNELSS, s (from *authen-*  
t ch) Authenticity

**AUTHOR** 1 (*auctor*, Lat) 1 The first  
 beginner or mover of any thing (*Hooker*) 2  
 The efficient cause that effects or produces any  
 thing, (*Dyer*) 3 The first writer of any  
 thing (*Dyce*) 4 A writer, general (*Shaks*)

AUTHORITY *a* (from *authority*)  
 I have an authority - I have, an air of  
 authority - I have (*swift*)

**AUTHORITATIVE** *ad* (from *authoritatem*) 1 In an authoritative manner, with a view of authority 2 With due authority

AUTHORIAL ABILITIES : Authoritative, penning

AL THORITY (auctōritas, Lat) 1 Le-  
gal power (Statute) 2 Influence, credit  
(Faculty) 3 Power in (State) 4 Sup-  
port & maintenance (Benefactor) 5 Testi-  
mony (evidence) 6 (credibility) (Hoolier)

**AUTHORITY**, in law, a power given by word or writing, to a third person to act for another, and may be by writ, warrant, commission, letter of attorney, &c.

At a **THORAX** is depicted, in painting like a woman on the chair of the richly decorated room and surrounded with old looking in her right hand a sword and a letter in a pipe. By her side is a double trophy of pool and cups.

AUTHORITY: (from *authorize*)  
Establishment by authority (*law*)

To AU THORP I / 1 a (autostr, Fr) 1  
 To say with only to my pen (Dryden) 2  
 To mid any thing k (to c) 3 10 sta  
 I wish my tru by ic bority (Hooker) 4 Tr  
 ju nify to prove a thm to be n (Lovel)  
 5 To g credit to any per on or thing (South)

AUROC ABDALLI, in antiquity, an order of musician, who wore an ivy crown or garland.

**AUTOCRAPHY**, a person who is his own ruler or master, and who has no other over him. The word is compounded of *αὐτός*, self, and *κραίνω*, I rule.

AUGUSTINE, in appellation assumed by some, is important that they spring from the soil which the still inhabited. In this sense the word amount to the same with *flour*.

**AUTOCRACY** (a. on o' l' i) Independent power, supremacy.

**AUTOCRATOR** (from *auto*, and *kratos*  
*power*) A person vested with an absolute  
independent power, by which he is rendered  
accountable to any other for his actions.  
The power of the Athenian generals, or com-  
manders, was usually limited, so that, at the

expiration of their office, they were hable to render an account of their administration But, on some extraordinary occasions, they were exempted from this restraint, and scut with a full and uncontrollable authority in which sense they were styled *Autopalaes*

**AUTO DA FE** See **ACT OF FAITH**

**AUTODIDACTUS** (from *αυτος*, and *διδασκω*, I teach) A person self-taught

**AUTOGRAPH**, the very hand writing of any person, or the original of a treatise or discourse. The word is used in opposition to a *copy* The word is formed of *αυτος*, and *γραφω*, scribo

Autographa, or original manuscript of the New Testament, are the copies written by the apostles, or by amanuenses under their inspection, though even used in this sense the term is not correct St Paul seems generally to have adopted the latter mode, but to prevent the circulation of spurious copies, he wrote the concluding benediction with his own hand The early loss of the autographa of the New Testament affords matter of surpris and regret, when it is known that the original manuscripts of Luther, and other eminent men who lived at the time of the reformation, are still subsisting Various causes may have contributed to this circumstance, some of which have been alleged in Griesbach's "Historia Textus I pistolarum Pauli, sect 11 See also Michaelis's Introduct vol 1 p 253

**AUTOGRAPHICAL** *a* (from *autographia*) Of one's own writing

**AUTOGRAPHY** *s* (*αυτογραφια*) A particular person's own writing, the original

**AUTOLITHOTOMUS**, he who cuts himself for the stone Of this we have a very extraordinary instance given by Reiseliu, in the Ephemerides of the Academy Natura Curiosa, dec 1 an 3 obs 192

**AUTOMATICAL** *a* (from *automaton*) Having the power of moving itself

**AUTOMATION** (from *αυτος*, *ipse*, and *μωωμαι*, I am excited, whence *αυτοματος*, spontaneous) A seemingly self-moving machine, or one so constructed, by means of weights, levers, pulleys, springs, &c as to move for a considerable time, as if it were endued with animal life And according to this description, clocks, watches, and all machines of that kind, are automata

It is said, that Archytas of Tarentum, 400 years before Christ, made a wooden pigeon that could fly, that Archimedes also made similar automations, that Regimontanus made a wooden eagle that flew forth from the city, met the emperor, saluted him, and returned, also that he made an iron fly, which flew out of his hand at a feast, and returned again after flying about the room, that Dr Hook made the model of a flying chariot, capable of supporting itself in the air Many other surprising automations we have been eye-witnesses of in the present age thus, we have seen figures that could write, and perform many other actions in imitation of animals Dr Collinson made a figure that played on the flute, the same gentleman also made a

duck, which was capable of eating, drinking and imitating exactly the voice of a natural one, and, what is still more surprizing, the food it swallowed was evacuated in a digested state, or considerably altered on the principles of solution, at the wing, viscera, and bones were formed so as strongly to resemble those of a living duck, and the actions of eating and drinking shewed the strongest resemblance, even to the muddling the water with its bill M La Droz of la Chaux de Fonds, in the province of Neuchatel, has also executed some very curious pieces of mechanism one was a clock, presented to the king of Spain, which had, among other curiosities, a sheep that imitated the bleating of a natural one, and a dog watching a basket of fruit, that barked and snarled when any one offered to take it away, besides a variety of human figures, exhibiting motions truly surprizing The celebrated chess player of Mr Kempell, which we have described under the word **ANDROIDES** is likewise a curious specimen of ingenuity, but ingenuity of a different sort from what has been generally supposed, as will appear by the following interesting extract from Dr Hutton's Math and Philos Dictionary

Thomas Collinson, esq nephew of the late ingenious Peter Collinson, esq writing to Dr Hutton communicates these particulars—

"Turning over the leaves of your late valuable publication, part I of the Mathematical and Philosophical Dictionary, I observed under the article *Automaton* the following

'But all these seem to be inferior to M Kempell's chess player, which may truly be considered as the greatest master piece in mechanics that ever appeared in the world, (upon which Mr Collinson observes) "So it certainly would have been, had its scientific movements depended merely on mechanism Being slightly acquainted with M Kempell when he exhibited his chess playing figure in London I called on him about five years since at his house at Vienna, another gentleman and myself being then on a tour on the continent The Baron (for I think he is such) showed me some working models which he had lately made—among them an improvement on Arkwright's cotton mill, and also one which he thought an improvement on Boulton and Watts's last steam-engine I asked him after a piece of speaking mechanism, which he had shown me when in London It spoke as before, and I forgot the name word I gave when I first saw it *Exploitation*, which it distinctly pronounced with the French accent But I particularly noticed, that not a word passed about the chess player, and of course I did not ask to see it In the progress of the tour I came to Dresden, where becoming acquainted with Mr Eden, our envoy there, by means of a letter given me by his brother lord Auckland, who was ambassador when I was at Madrid, he obligingly accompanied me in seeing several things worthy of attention And he introduced my companion and myself to a gentleman of rank and talents, named Joseph

**Fredrick Freyhere**, who seems completely to have discovered the vitality and soul of the chess-playing figure. This gentleman courteously presented me with the treatise he had published, dated at Dresden, Sept 30 1789, explaining its principles, accompanied with various plates neatly coloured. This treatise is in the German language, and I hope soon to get a translation of it. A well-taught boy, very thin and small of his age (sufficiently so that he could be concealed in a drawer almost immediately under the chess board), agitated the whole. Even after this abatement of its being strictly an automaton, much ingenuity remains to the contriver. This discovery at Dresden accounts for the silence about it at Vienna, for I understand, by Mr Eden, that Mr Freyhere sent a copy to baron Kempell to which he seems unwilling to acknowledge that Mr P has completely analysed the whole.

"I know it is long and uninteresting letters are formidable things to men who know the value of time and science, but as this happens to be upon the subject, forgive me for adding one very admirable piece of mechanism to those you have touched upon. When at Geneva, I called upon Droz, son of the original Droz of la Chaux de Fonds (where I also was). He showed me an oval gold snuff box about (if I recollect right) 4 inches and a half long, by 3 inches broad, and about an inch and a half thick. It was double, having in horizontal partition, so that it may be considered as one box placed on another with a lid of course to each box—One contained snuff—In the other, as soon as the lid was opened, there rose up a very small bird, of green enamelled gold, sitting on a gold stand. Immediately this minute curiosity wagged its tail, shook its wings, opened its bill of white enamelled gold, and poured forth, minute as it was (being only three quarters of an inch from the beak to the extremity of the tail) such a clear melodious song, as would have filled a room of 20 or 30 feet square with its harmony—Droz agreed to meet me at Florence, and we visited the abbe Fontana together. He afterwards joined me at Rome, and exhibited his bird to the pope and the cardinals in the Vatican palace to the admiration, I may say to the astonishment, of all who saw and heard it.

Another extract from a second letter upon the same subject, by Mr Goussier, is as follows. "Permit me to speak of another automaton of 1782, which several years since he exhibited in England, and which, from my personal acquaintance, I had a commodious opportunity of particularly examining. It was a figure of a man, I think the size of life. It held in its hand a metal style, a card of Dutch vellum being laid under it. A spring was touched which released the internal clockwork from its stop, when the figure immediately began to draw. Mr Droz happening once to be sent for in a great hurry to wait upon some considerable personage at the west

end of the town, left me in possession of the keys, which opened the recesses of all his machinery. He opened the drawing master himself, wound it up, explained its leading parts, and taught me how to make it obey my requireing, as it had obeyed his own. Mr. Droz then went away. After the first card was finished, the figure rested. I put a second, and so on, to five separate cards, all different subjects but five or six was the extent of its delineating powers. The first card contained, I may truly say, elegant portraits and likenesses of the king and queen, facing each other and it was curious to observe with what precision the figure lifted up his pencil, in the transition of it from one point of the draft to another, without making the least slur whatever for instance, in passing from the forehead to the eye, nose, and chin, or from the waving curls of the hair to the ear, &c. I have the cards now by me."

M. Truchet of the French Academy of Sciences, invented and completed a moving picture, which represented in opera in five acts, and in which there was produced a change of decoration in each act. This picture contained a prodigious number of figures, which, as in true pantomimes, expressed by their gestures and motions all the requisite actions. Each of these figures were extremely small, for the whole machine was only 16 1/2 inches broad, 13 1/2 inches high, and 1 1/2 thick.

**AUTOMATOUS** *a* (from *automaton*) Having in itself the power of motion (*Brown*).

Boerhaave calls those motions automatic or automotous which depend on the structure of bodies, and in which the will does not contribute, such are respiration, the circulation of the blood &c.

**AUTONOMY** *s* (αὐτονομία) The living according to one's mind and prescription.

**AUTOPSY** *s* (αὐτοψία) Ocular demonstration (*Ray*).

**AUTOPTICAL** *a* (from *autopsy*) Perceived by one's own eyes (*Brown*).

**AUTOPTICALLY** *ad* (from *autoptical*) By means of one's own eyes (*Brown*).

**AUTRICUM**, the capital of the Carnatas, a people of Galla Celtic afterwards called Carnotena, Carnotenus, and Civitas Carnotenum, now Chartres, in the Orleansois on the Eure.  $47^{\circ}$  long  $1^{\circ} 32'$  N lat.  $48^{\circ} 47'$ .

**AUTUMN**, the third season when the harvest and fruits are gathered in. This begins at the descending equinox, which, in the northern hemisphere, is when the sun enters the sign Libra, or about the 22d day of September, and it ends when winter commences, about the same day in December.

**AUTUMNAL**, something belonging to autumn. Thus,

*Autumnal Equinox*, the time when the sun enters the descending point of the ecliptic, where it crosses the equinoctial, and is so called because the nights and days are then equal.

*Autumnal Point*, the point of the ecliptic answering to the autumnal equinox.

*Autumnal Signs*, are the signs Libra, Scor-

## A W A

**pio**, Sagittary, through which the sun passes during the autumn

**AUTUN**, an ancient town of France, the episcopal see of the department of Saône and Loire, in the late province of Burgundy. It is 46° 57' N Lon 4° 23' E. This is the ancient Bibracte

**AUVERGNE**, a late province of France, about 100 miles in length, and 75 in breadth. It now forms the two departments of Cantal and Puy-de-Dôme

**AVULSION** *s* (*avulsio*, Lat.) The act of pulling one thing from another. (*Philips*)

**AUXERRE**, a town of France, in the department of Yonne, late in episcopal see of Burgundy. Lat 47° 18' N Lon 3° 39' E

**AUXESIS** (*αὐξήσις* from *αὐξάνω* to increase), the augmentation or growth of a disorder

**AUXILIAR** **AUXILIARY** *s* (from *auxilium*, Lat.) Helper, assistant (*South*)

**AUXILIAR** **AUXILIARY** *a* (from *auxilium*, Latin) Assistant, helping (*Hall*)

**AUXILIARY** **VLRB**, in grammar, are such as help to form or conjugate others, that is, are prefixed to the *v*, to form or denote the modes or tenses thereof, as, *to have* and *to be*, in the English, *être* and *avoir*, in the French, *ho* and *sono* in the Italian &c. In the English language, the auxiliary verb *am* supplies the want of passive verb

**AUXILIATION** *s* (from *auxiliatus*, Lat.) Help, aid, succour

**AUXILIUM CURIÆ**, in law a precept or order of court, to cite or convene one party at the suit of another

**AUXILIUM AD FILIUM MILITEM FACIENDUM, VEL FILIAM MARITANDAM** a precept or writ directed to the sheriff of every county where the king or other lords had any tenants, to levy of them reasonable aid towards the knight's his eldest son, or the marriage of his eldest daughter

**AUXUM** formerly the opulent metropolis of Ethiopia, according to Arrian and Nonnosus, was undoubtedly the same city as the modern Axum, or as the Abyssinians call it, Ascum. It is situated about 11° 30' N Lat and 36° 2' of E Lon. It is now almost ruined, scarcely affording shelter to 100 inhabitants

**AUXY WOOL**, a name given to the fin wool which is spun in the neighbourhood of Abbeville

**AUZOUT**, or **AZOUR** (Adrian), a French mathematician, was born at Rouen and died in 1691. It is generally believed that he invented the micrometer, in 1663, though he was not the only inventor, for it is extremely probable that a similar instrument was contrived by Mr. Gascoigne, by the marquis de Valvasor, by Picard, and by Huygen, totally independent of each other. Azout's treatise on the micrometer was published, after his death, in 1693. He was the first who thought of using the telescope to the astronomical instrument

**AWAIT** *a* (from *a* and *wait*) 1 To

## A W K

expect, to wait for (*Faust*) 2 To attend; to be in store for (*Hogers*)

**AWAIT** *s* (from the verb) Ambush (*Spenser*)

**To AWAKE** *v* *a* (peccian, Saxon) 1 To rouse out of sleep (*Shakspeare*) 2 To raise from any state resembling sleep (*Dryden*) 3 To put into new action (*Pope*)

**To AWAKE** *v* *n* To break from sleep, to cease to sleep (*Shakspeare*)

**AWAKE** *a* (from the verb) Without sleep, not sleeping (*Dryden*)

**To AWAKEN** *a* and *n* See **AWAKE**

**To AWARD** *v* *a* (peccian, Saxon) To adjudge, to give any thing by a judicial sentence (*Collins*)

**To AWARD** *v* *n* To judge, to determine (*Pope*)

**AWARD** *s* (from the verb) Judgment, sentence, determination (*Johnson*)

**AWARD** in law, the judgment of an arbitrator or of one who is chosen by the parties themselves for terminating their difference. See **ARBITRATOR**

**AWARE** *ad* (συναισθάνω, Saxon) I scited to caution, vigilant, attentive (*Johnson*)

**To AWARE** *v* *n* To beware, to be cautious (*Johnson*)

**AWAY** *ad* (απέρ, Saxon) 1 In a state of absence (*Ben Jonson*) 2 From any place or person (*Pope*) 3 Let us go (*Shakspeare*) 4 Be gone (*Smith*) 5 Out of one's own hand (*Johnson*) 6 On the way (*Shakspeare*)

**AWAY**, (ete, Saxon) Reverential fear, reverence (*South*)

**To AWE** *v* *a* (from the noun) To strike with reverence, or fear (*Bacon*)

**AWL** *ad* (Achel)

**AWL** in navigation the anchor is called a weigh, or a trip, when the cable being drawn perpendicular to it and continued to be heaved into the ship, it length weighs or trips it out of the ground

**AWFUL** *a* (from *awe* and *fall*) 1 That strikes with awe, or fills with reverence (*Milton*) 2 Worhsipful, invested with dignity (*Shakspeare*) 3 Struck with awe, timorous (*Hall*)

**AWFUL** *ad* (from *awful*) In a reverential manner (*South*)

**AWFULNESS** *s* (from *awful*) 1 The quality of striking with awe, solemnity (*Johnson*) 2 The state of being struck with awe (*Johnson*)

**To AWHALE** *v* *a* To strike, to confound, to terrify (*Spenser*)

**AWHILE** *ad* Some time (*Johnson*)

**AWK** *a* (from *awkward*) Odd (*Johnson*)

**AWK** See **ALCUS**

**AWKWARD** *a* (σκαπός, Saxon) 1 Unclear, unpolite, untwight (*Shakspeare*) 2 Unready, unhandy, clumsy (*Dryden*) 3 Perverse, untoward (*Hudibras*)

**AWKWARDLY** *ad* (from *awkward*) Clumsily, unready, inelegantly (*Hall*)

**AWKWARDNESS** *s* (from *awkward*) Inelegance, want of civility, oddness, unsuitableness (*Hall*)



**AWL**, *s* (wile, ale, Sax) A pointed instrument to bore holes (*Mortimer*)

**AWL**, or **AUL**, among shoe-makers, an instrument to bore holes through the leather, to facilitate the stitching, or sewing the same. The blade of the awl is usually a little flat and rounded, and the point ground to an acute angle.

**AWL SHAPED** See **SUBULATF**

**AWI WORT** See **SUBULANA**

**AWILSS** *a* (from *awe* and *less*) 1 Wanting reverence (*Dryden*) 2 Wanting the power of causing reverence (*Shakespeare*)

**AWME** *s* A Dutch measure answering to what in England is called a tierce, or one seventh of an English ton (*Aruthnot*)

**AWN** (*hula*) A slender sharp process issuing from the glume or chaff in corn and grasses. It is commonly called in English the beard, but this term is otherwise applied. See **BEARD**

The awn is either terminating, fixed to the top of the glume, or decid, placed on the back or outside of it.

It is also straight, *paniculate*, or bent like the *hinc* joint. Recurved, or bowed back. Twisted (twisted), or coiled like a rope.

The *anther* sometimes terminates in an awn.

**AWNED** (*aristatus*) Having an awn as the glume and other.

**AWNING** among seamen, a canopy of canvas extended over the decks in hot weather, to protect them from being split by the heat of the sun, likewise for the convenience of the officers, &c.

**AWNLESS** (*muticus*) Having no awn, opposed to *awned*. As in the glume of a rose-tree and in the calyx of serrisulph, the seeds of idonis, &c. An awn, however, is said to be *mutica*, or beardless, when it is not sharp-pointed, *acumini destituta*.

**AWOKE** The pretent of *awake*

**AWORK** *ad* (from *a* and *work*) On work in a state of labour (*Shaks*)

**AWORKING** *ad* (from *awork*) In the state of working (*Spenser*)

**AWRY** *a* (from *a* and *wry*) 1 Not in a straight direction, obliquely (*Milton*) 2 A-junt, with oblique vision (*Deuham*) 3 Not level unevenly (*Brewster*) 4 Not equally between two points (*Pope*) 5 Not in a right title, perversely (*Sidney*)

**AXAMENIA**, in antiquity, a denomination given to the *verses*, or songs, of the *sala*, which they sung in honour of *Am* men. The word is formed according to some from *axare*, *q d nominat*. Others will have the *carmina salumia* to have been denominated *axamenta*, on account of their being written in *axibus*, or on wooden tables.

**AXBRIDGE**, a town of Somersetshire, with a market on Thursdays. It is 51 17 N. Lon 3 0 W. The only manufacture of this place is knit hose.

**AXIS** *s* (axis, Sax) An instrument consisting of a metal head with a sharp edge, fixed in a handle (*Dryden*)

**AXE**, in geometry See **AXIS**

**AXE-FORM** See **DOLABRIFORM**

**AXF VETCH** See **HATCHET VETCH**

**AXIL** or **AXILLA**, in botany, the angle formed by a branch with the stem, or by a leaf with the branch. So named from its similarity to the armpit. Some old writers call it *ala*, but this term is otherwise appropriated.

**AXILLA** (*axilla*, derived by Scaliger from *ago*, to act, after the following progression *a-o*, *ato*, *ara*, *axala*, *axilla*, but more probably directly from the Hebrew *axil*) The cavity under the upper part of the arm, called the armpit.

**AXILIARY ARTERIES** Arteriae axillares. The axillary arteries are continuations of the subclavians, and give off, each of them, in the axilla, four mammary arteries, the subscapular and the posterior and anterior circumflex arteries, which ramify about the joint.

**AXILLARY LEAVES**, in botany, growing at the angle formed by the branches with the stem, or inserted at the base of the branch. Axillary peduncle, scape, cirrus or tendril, and thorn, proceeding from the axils, or from the bosom of the leaves or branches.

**AXILIARY NERVE** Articular nerve. A branch of the brachial plexus, and sometimes of the radial nerve. It runs outwards and backwards around the neck of the humerus, and is lost in the muscles of the scapula.

**AXILLARY VEINS** Venae axillares. The axillary veins receive the blood from the veins of the arm, and evacuate it into the subclavian vein.

**AXIM** a territory on the gold coast of Guinea, containing two or three villages on the sea-shore. The chief town is of the same name, and lies in lat 5 0 N. lon 2 4 W.

**AXINIA**, the ancient name of a mountain of Peloponnesus, in Arcadia.

**AXINIUM** the name given by Appian to an ancient city of Spain.

**AXINOMANCY** **AXINOMANTIA**, (from *axin*, secure, and *mantia*, divination,) an ancient species of divination, or a method of foretelling future events by means of an axe or hatchet. This art was in considerable repute among the ancients, and was performed, according to some, by tying anagate-stone on a red-hot hatchet, and also by fixing a hatchet on a round stake so as to be exactly poised, then the names of those that were suspected were repeated, and he at whose name the hatchet moved was pronounced guilty.

**AXIOM** **AXIOMA** (from *axiōw*, I am worthy) A self-evident truth, or a proposition whose truth every person receives at first sight. Thus, that the whole is greater than a part, that a thing cannot be and not be at the same time, and that from nothing, nothing can arise, are axioms.

**AXIOM** is also an established principle in some art or science. Thus, it is an axiom in physics, that nature does nothing in vain, that effects are proportional to their causes, &c. So it is an axiom in geometry, that things

## A X I O M S.

equal to the same third are also equal to one another, that if to equal things you add equals, the sums will be equal, &c. It is an axiom in optics, that the angle of incidence is equal to the angle of reflection, &c.

**NEWTONIAN AXIOMS, OR LAWS OF MOTION,** are the three following

1 Every body perseveres in its state of rest or uniform motion in a right line, until a change is effected by the agency of some external force

2 Any change effected in the quiescence or motion of a body is in the direction of the force impressed, and is proportional to it in quantity

3 Action and reaction are equal and in contrary directions

When speaking of these axioms, or laws of motion, it ought always to be recollected that they are not the efficient, operative, causes of any thing. A law presupposes an agent, for it is only the mode, according to which an agent proceeds. It implies a power, for it is the order according to which that power acts. Abstracted from this agent, this power, the law does nothing, is nothing: so that a law of nature or of motion can never be assigned as the adequate cause of phenomena, exclusive of power and agency.

The Newtonian axioms are, in reality, intermediate propositions between geometry and philosophy, through which mechanics becomes a mathematical branch of physics, and its conclusions possessed of such coherence and consistency among themselves, and with matters of fact as are rarely to be found in other branches, which admit not of so intimate a union with the science of quantity.

The evidences from which our assent to these axioms is derived, are of various kinds.

1 From the constant observation of our senses, which tend to suggest the truth of them in the ordinary motion of bodies, as far as the experience of mankind extends. 2 From experiments, properly so called. 3 From arguments *a posteriora*. One or other of these kinds of evidence generally forms a part of our most valuable treatises on mechanics and physics; but there is a fourth way in which the truth of these axioms may be deduced, and which, as it is concise, we shall here adopt, we mean that in which they are shewn to be laws of human thought, intuitive consequences of the relations of those ideas which we have of motion, and of the causes of its production and changes.

Thus, with respect to the first axiom. It has been fully demonstrated that the powers or forces, of which we speak so much, are never the immediate objects of our perception. Their very existence, their kind, and their degree, are instinctive inferences from the motions which we observe and class. It evidently follows from this experimental and universal truth, 1st That where no change of motion is observed, no such inference is made, that is, no power is supposed to act. But whenever any change of motion is observed, the infer-

ence is made, that is, a power or force is supposed to have acted.

In the same form of logical conclusion, we must say that, 2d When no change of motion is supposed or thought of, no force is supposed, and that whenever we suppose a change of motion, we, in fact, though not in terms, suppose a changing force. And, on the other hand, whenever we suppose the action of a changing force, we suppose the change of motion, for the action of this force, and the change of motion, is one and the same thing. We cannot think of the action without thinking of the indication of that action, that is, the change of motion. — In the same manner, when we do not think of a changing force, we suppose that there is no action of a changing force: we in fact, though not in terms, suppose there is no indication of this changing force, that is, that there is no change.

Whenever, therefore, we suppose that no mechanical force is acting on a body we, in fact, suppose that the body continues in its former condition with respect to motion. If we suppose that nothing accelerates or retards, or deflects the motion, we suppose that it is not accelerated, nor retarded nor deflected. Hence follows the proposition in express terms — We suppose that the body continues in its former state of rest or motion unless we suppose that it is changed by some mechanical force.

And again with regard to the 2d axiom, it may almost be considered as an identical proposition, for it is equivalent to saying that the changing force is to be measured by the change which it produces, and that the direction of this force is the direction of the change. Of this there can be no doubt when we consider the force in no other sense than that of the cause of motion, paying no attention to the form or manner of its exertion. Thus, when a pellet of tow is shot from a pop gun by the expansion of the air compressed by the rammer, or when it is shot from a toy pistol by the unbanding of the coiled wire, or when it is nicked away by the thumb like a marble — if, in all these cases, it moves off in the same direction, and with the same velocity, we cannot consider or think of the force, or at least of its exertion, in any way different. Nay, when it is driven forward by the instantaneous percussion of a smart stroke, although the manner of producing this effect (if possible) is essentially different from what is concerned in the other cases, we must still think that the propelling force, considered as a propelling force, is one and the same. I shall, this law of motion, is thus expressed by Sir Isaac Newton, is equivalent to saying “That we take the changes of motion as the measures of the changing forces, and the direction of the change for the indication of the direction of the forces.”

As to the third axiom, it is commonly stated as founded on experience alone, and not as a necessary truth. It is indeed a universal fact that it is now found that the reciprocity of action,

which is affirmed in this axiom, obtains throughout the solar system with the utmost precision. It is also, we conceive, a law of human thought. To assert the contrary, is to maintain an absurdity, for if action and reaction are not equal, the result either acts against nothing, and is therefore not action, or exists without a cause. See ACTION.

**AXIOS**, a form of acclamation, anciently used by the people in the election of bishops. When they were all unanimous, they cried out *axios* he is worthy, or *anaxios*, unworthy.

**AXIOSIS**, in rhetoric, denotes the third part of an exordium, sometimes also called *protasis*, and containing some new proposition more nearly relating to the matter in hand than the *peritrochion*.

This in Cicero's oration pro Milone, the protasis is, "Non possum non timere, iudices, vixi hic nova iudicii forma," the *axiosis*, "Nec enim ex corona confessus vester cinctus es, qui olebat tibi *caesari*." "Sed me recit Pompei consilium, cuius sapientie non fuerit quicquam iudicium, et tibi nihil dedit." the basis *basis*, "Quamobrem idcirco iudices, et timorem, si quicquam habetis, depone." *See* DEN-TAILS.

**AXIS** (axis, from *ago*, to act.) See DEN-TAILS.

**AXIS**, in astronomy, an imaginary right line supposed to pass through the earth, sun, planets, satellites, &c. and about which they perform their respective diurnal rotations.

The earth and planets in their progress through the annual orbit, move in such a manner that the axis of each always keeps parallel to itself, or points to the same parts of the heavens. See PARALLELISM and AXIS OF ROTATION.

The axis of the earth is inclined to the ecliptic in an angle of nearly  $66\frac{1}{2}^{\circ}$ , a position which is well adapted for promoting the fertility of the earth and rendering it habitable. This position it has been proved (see ASTRONOMY) by La Grange and La Place, cannot far be deviated from, while the universe continues to be regulated by the same laws.

Dr Keill, in his Examination of Burnet's Theory of the Earth, has pointed out many advantages which result from this inclination of the axis, particularly in ripening the fruits of the earth, and he has proved the truth of much that was advanced by Kepler in his *Ipse Astron. Copernici* to the same effect. Among other curious particulars, Keill has shewn that who live beyond  $40^{\circ}$  of latitude, and have great need of the sun's heat, have more of it during the whole year than if the equator and ecliptic coincided, whereas they who live between the equator and  $45^{\circ}$  deg. of latitude, and are rather too much exposed to the sun than too little, have, on account of the present inclination, less of the sun's heat than if the earth were in a right position. P 71, &c. These considerations ought to lead us into a transcendent admiration of the Divine Wisdom and Goodness.

Professor Bode of Berlin has lately publish-

ed Thoughts on the supposed Variations in the Axis and Poles of the Earth. For which, see Phil Mag No 44.

**Axis of the Horizon, Equator, &c.** Is a right line drawn through the centre of the respective circle, perpendicular to its plane.

**Axis**, in geometry, the straight line in a plane figure, about which it revolves, to produce or generate a solid. Thus, if a semicircle be moved round its diameter at rest, it will generate a sphere, whose axis is that diameter. And if a right angled triangle be turned about its perpendicular at rest it will describe a cone, whose axis is that perpendicular.

Axis is yet more generally used for a right line conceived to be drawn from the vertex of a figure to the middle of the base. So the

**Axis of a Circle or Sphere**, is any line drawn through the centre and terminated at the circumference, on both sides.

**Axis of a Cone**, is the line from the vertex to the centre of the base.

**Axis of a Cylinder** is the line from the centre of the one end to that of the other.

**Axis of a conic Section** is the line from the principal vertex, or vertices, perpendicular to the tangent at that point. The ellipse and hyperbola have each two axes, which are finite and perpendicular to each other, but the parabola has only one, and that infinite in length.

**Transverse Axis** in the ellipse and hyperbola, is the diameter passing through the two foci and the two principal vertices of the figure. In the hyperbola it is the shortest diameter, but in the ellipse it is the longest.

**Conjugate Axis**, or **Second Axis**, in the ellipse and hyperbola, is the diameter passing through the centre, and perpendicular to the transverse axis. It is the shortest of all the conjugate diameters.

**Axis of a conic Line** is still more generally used for that diameter which has its ordinates at right angles to it, when that is possible.

**Axis**, in mechanics, is a claim line about which a body may turn. Axes are of various kinds, is

**Axis of a Balance**, the line upon which it moves or turns.

**Axis of Rotation**, the line about which a body really revolves, when it is put into motion. The impulse given to a homogeneous sphere, in a direction which does not pass through its centre, will cause it to revolve constantly round the diameter, which is perpendicular to a plane passing through its centre, and the line of direction of the impressed force. New forces acting on all its parts, and of which the result, through its centre, will not change the parallelism of its axis of rotation. Thus it is that the axis of the earth remains always nearly parallel to itself in its revolution round the sun, without its being necessary to suppose, with Copernicus, an annual motion of the poles of the earth round those of the ecliptic.

If the body possess a certain figure, its axis of rotation may change every instant. The

## AXI

determination of these changes, whatever may be the forces acting on the bodies, is one of the most interesting problems of mechanics respecting hard bodies, on account of its connection with the precession of the equinoxes, and the libration of the moon. The solution of this problem has led to a curious and very useful result, namely, that in all bodies there exist three axes perpendicular to each other, round which the body may turn uniformly when not solicited by external forces. On this account these axes are properly called principal axes of rotation.

*Axis of Oscillation*, is a line parallel to the horizon, passing through the centre, about which a pendulum vibrates, and perpendicular to the plane in which it oscillates.

*Axis in Peritrochio*, one of the five mechanical powers, consisting of a peritrochium or wheel, and moveable together with it about its axis. The power is applied at the circumference of the wheel, and the weight is raised by a rope that is gathered up on the axis while the machine turns round. The power may be conceived as applied at the extremity of the arm of a lever, equal to the radius of the wheel, and the weight as applied at the extremity of a lever, equal to the radius of the axis, only those arms do not meet at one centre of motion, as in the lever, but in place of this centre we have an axis of motion, viz. the axis of the whole machine. See *MECHANICS*.

The use of this machine is to raise weights to a greater height than the lever can do, because the wheel is capable of being turned several times round, while the lever is not, and also to communicate motion from one part of a machine to another. Accordingly, there are few compound machines without it.

If the power applied to the axis in peritrochio, in a direction tangential to the periphery of the wheel, or perpendicular to the scytala or spoke, be to a weight, as the radius of the axle to the radius of the wheel, or the length of the spoke, the power will just sustain the weight, that is, the weight and power will be in equilibrio.

*AXIS*, in optics. Optic axis, or visual axis, is a ray passing through the centre of the eye, or falling perpendicularly on the eye.

*Axis of a Lens, or Glass*, is the axis of the solid of which the lens is a segment. Or the axis of a glass, is the line joining the two vertices or middle points of the two opposite surfaces of the glass.

*Axis of a Magnet*, is a line passing through the middle of a magnet lengthwise in such a manner is that, however the magnet is divided, provided the division is made according to a plane in which such line is found, the magnet will be cut or separated into two loadstones, and the extremes of such lines are called the poles of the magnet.

*AXIS*, in anatomy, the second vertebra of the neck, so called from the head's turning on it like an axis.

*AXIS*, in zoology, an animal of the deer kind. See *CERVUS*.

## AYL

*AXLE AXLE-TREE* *s* (*axis*, Latin). The pin which passes through the midst of the wheel, on which the circinvolutions of the wheel are performed (*Milton*).

*AXMINSTER*, a town of England, in the county of Devon, on the river Ax, celebrated for a carpet manufacture, wrought of any size in one piece, with needles by women. There are likewise manufactures of broad and narrow cloth, cotton-tapes, and dingdgets. The number of inhabitants of the town and parish 2500. It has a market weekly twenty-six miles E. Exeter, and 147 W. London. Lat 50 46 N. Lon 3 8 W.

*AXUM*, once the large and populous capital of Abyssinia, now an inconsiderable town, containing about 600 houses. Lat 14 6 N. Lon 38 30 E.

*AXUNGIA* (*arungia*, from *avis*, an axle-tree, and *unguo*, to anoint). In medicine, hog's lard.

*AXUNCIA OF GLASS*, is seen or felt when from the top of the master of glass before it is thoroughly vitrified.

*AXYRIS* In botany, a genus of the class and order monœcia triandria. Male, calyx three parted, corollaless. Fem. calyx two leaved, corollaless, styles two, seed one. Three species, all of Siberia.

*AY ad* (perhaps from *avo*, Latin). Yes (*Shakspeare*).

*AYE ad* (from *ay*, Saxon, and *eo*). Always, to eternity, for ever (*Philips*).

*AYL-AYL*, in zoology, a singular quadruped discovered in Madagascar, about the size of a rabbit. Its name is an exclamation of the inhabitants, which M. Sonnerin applied to this animal. Both male and female are slothful and gentle animals, and, like owls, they are scarcely able to discern objects in the daytime. They live chiefly under ground, feeding on worms and insects which they find in the earth or in crevices in the trunks of trees, whence they extract them by means of their long and slender toe. Sonnerin forms a new genus of this animal under the name of *echinomys*, the generic character of which is its long toes, and the thumb of the hinder paw turned backward. It belongs to the class primates, order glirres, and is perhaps related to the marmot tribe.

*AYENIA*. In botany, a genus of the class and order pentandria monogynia. Petals five, united into a tube, nectary a cup covering the pistil, and bearing the stamens, capsule five-celled. Four species, all natives of America or the West Indies.

*AY-GREEN*. The same with houseleek.

*AYGUA*, in zoology. See *SIMIA*.

*AYLESBURY*, in geography. See *ARTESBURY*.

*AYLOFFT* (Sir Joseph), of Framfield in Sussex, was descended from a Saxon family, anciently seated at Bocton Alos near Wye, in the county of Kent, in the reign of Henry III. who removed to Hornechurch in the county of Essex in that of Henry IV. and to Sudbury in that of Edward IV. He was born about

## A Y L

the year 1708, received the early part of his education at Westminster-school, admitted of Lincoln's Inn 1724, and in the same year was entered a gentleman-commoner at St John's college, Oxford, which college he quitted about 1728, elected F A S February 10, 1731, one of the first council under their charter, 1751, vice president, and F R S June 3, 1731. He prevailed on Mr Kirby, painter in Ipswich, to make drawings of a great number of monument and buildings in Suffolk, of which twelve were engraved, with a description, 1748, and others remain unpublished. He had it that time an intention to write a history of the county, but, being disappointed of the materials which he had reason to expect for so laborious a work, they were never published. On the building of Westminster bridge, he was appointed secretary to the commissioners 1736 7, and on the establishment of the Paper office, on the respectable footing it at present is, by the removal of the state-printers from the old site at Whitehall to new apartments at the Treasury, he was nominated the first in the commission for the care and preservation of them. In 1737 he circulated proposals for printing, by subscription, *Encyclopadia*, or, a rational Dictionary of Arts and Sciences, and Trade. In 1772 he published, in 4to *Calendars of the Ancient Charters &c* and of the Welsh and Scottish Rolls now remaining in the Tower of London, &c and in the introduction gives a most judicious and exact account of our public records. He drew up the account of the chapel of London-bridge, of which an engraving was published by Vertue, 1748, and again by the Society of Antiquaries, 1777. His historical description of the interview between Henry VIII and Francis I. on the Champ de Drap d'Or, from an original painting at Windsor, and his account of the paintings of the same age at Cowdrey, were inserted in the third volume of the *Archæologia*, and printed separately to accompany engravings of two of these pictures by the Society of Antiquaries, 1775. His account of the body of Edward I. as it appeared on opening his tomb, 1774, was printed in the same volume, p. 376. Having been educated, as has been observed, at Westminster, he acquired an early affection for that venerable cathedral, and his intimate acquaintance with every part of it displayed itself in his accurate description of five monuments in the choir, engraved in 1779 by the same Society, who must reckon, among the many obligations which they owe to his zeal and attention to their interests, the last exertions of his life to put their affairs on the most respectable and advantageous footing, on their removal to their new apartments in Somerset-place. He superintended the new edition of *Leland's Collectanea*, in nine volumes 8vo and also of the *Liber Niger Scaccarii*, in two volumes 8vo, to each of which he added a valuable appendix. He also revised through the press a new edition of Hearne's *Curious Discourses*, 1771, two volumes 8vo, and like

## A Z A

wise the *Registrum Rossense*, published by Mr Thorpe in 1709, 12mo. At the beginning of the seventh volume of *Somers's Tracts* is advertised, *A Collection of Debates in Parliament before the Restoration*, from MS. by sir Joseph Ayloffe, bart which is supposed never to have appeared. Sir Joseph died at his house at Kensington-lane, Lambeth, April 19, 1781, aged seventy-two.

AYR, a county of Scotland, bounded on the west by the Frith of Clyde, on the south by the county of Wigton and county of Kirkcubright, on the east by the counties of Lanark and Dumfries, and on the north by the county of Renfrew, its form nearly triangular, the base towards the Clyde, with a considerable hollow in the centre, and contains about 1025 square miles. The chief towns are Ayr, Girvan, Ballintore, Saltcoats, Kilmarnock, and Irvine. The principal rivers are the Ayr, the Doon, and the Irvine. The population of this county in 1890 was 84,306, of which 44,640 were females.

AYR, a seaport town of Scotland, in the county to which it gave name, on the Frith of Clyde. The number of houses in Ayr is about 730, and the population 5192. It had formerly a considerable herring fishery rather more than forty years ago, these fish were caught in great abundance, but after they left the coast, haddock and cod have been plentiful ever since sixty miles SW Edinburgh. Lat 55 32 N. Lon 4 39 W. Greenwich.

AYR, a river of Scotland, which rises on the borders of Lancashire crosses the county to which it gives name, and runs into the Frith of Clyde, near the town of Ayr.

AYR, a river of France, which runs into the Arne, near Gindpre.

AYRAINS, a town of France in the department of the Somme, and chief place of a canton, in the district of Amiens nine miles SSE Abbeville.

AYRY or AERY, a nest or company of hawks, so called from the old French word *aire* which signifies the same, now sometimes applied to nests of other birds.

AYUD, a province of Hindostan, containing the most northern countries belonging to the Moguls, and situated to the northwest of the Ganges.

AZAB a territory on the Abyssinian coast of the Arabian gulf, near the straits of Babel-mandel, which has been from time immemorial the mart of frankincense, myrrh, and balsam.

AZAC (a *ah*, Arab.) Gum ammoniac. AZA'LEA American upright honey-suckle a genus of the class and order pentandria monogynia. Corolla campanulate, stamens inserted on the receptacle, capsule five celled. Seven species, widely distributed over the globe, of which the procumbens is a native of our own mountains.

AZATHIUS (*αζαθιο*, from *αζα*, to dig up, or *erhaus*). A term in old horsemanship applied to an old worn-out jade.

AZIMOR, a sea port town of Morocco, in

## A Z O

**Africa**, it was formerly a considerable place, but was demolished by the Portuguese in 1513  
**Lat 32 50 N Lon 7 0 W**

**AZARIAH**, the name of one of the kings of **Judea**, see 2 Kings, vi 2 Chron xxvi There are indeed in many high priests and others mentioned in Scripture, and in the Jewish history, who bore the name of Azariah

**AZAROTH** See **CRAIÆCUS**

**AZELLIOGI**, in astronomy, a fixed star in the **Swan's tail**

**AZFRINA** See **PRUNUS**

**AZIMUTH**, in astronomy, an arch of the horizon, intercepted between the meridian of the place, and the vertical circle passing through the centre of an object: it is found at the equinox by saying As the radius, to the tangent of the latitude of the place, so is the tangent of the sun's or star's altitude, to the cosine of the azimuth from the south To find the sun's or a star's azimuth at other times, see **O** Gregory's **Astron** ch vi

**Magnetical Azimuth**, is an arch of the horizon contained between the sun's azimuth circle and the magnetical meridian

**AZIMUTH COMPASS**, an instrument adapted to find in a more accurate manner than by the common sea compass the sun or star's magnetical amplitude, or azimuth It is also used to take the bearings of headlands, ships, and other objects at a distance The azimuth compass differs from the common sea compass in this: that the circumference of the card or box is divided into degrees, and there is fitted to the box an index with two sights which are upright pieces of brass placed diametrically opposite to each other, having a slit down the middle of them, through which the sun or star, or other object is to be viewed, at the time of observation See **COMPASS**

**AZIMUTH PLATE**, one whose style or gnomon is at right angles to the plane of the horizon

**AZIMUTHS** called also vertical circles, are great circles intersecting each other in the zenith and nadir, and cutting the horizon at right angles

**AZINCOURT** See **AGINCOURT**

**AZMER**, the capital of a province of the same name in **Mogulstan**, in the **East Indies** Its principal trade is in salt-petre

**AZOGA SHIPS**, the Spanish ships which carry quicksilver to the Spanish West Indies

**AZONI** in ancient mythology a name applied by the Greeks to such of the gods as were deities at large not appropriated to the worship of any particular town or country, but acknowledged in general by all countries and worshipped by every nation The chief I thus called dii commune Of this sort were the **Sun**, **Mars**, **Luna**, &c

**AZOTH** See **ASOPH**

**AZOEH** (See **of**), called by the ancients **Pelus Moëris**, formerly by the Russians the **Pand Sea**, is a river the source to which it is joined by a river It is situated in the dominions of **Russia**, lon about 57 E of **Perro** and lat 45 20 to 47 20 N It is about

## A Z O

210 miles in length and from 40 to 60 in breadth

**AZORES**, or **WESTERN ISLANDS**, a group of islands, situated in the Atlantic ocean, between 37 and 40 degrees of N lat and 27 and 32 degrees of W lon They are nine in number, and their names are **St Maria**, **St Miguel**, **Fernera**, **St George**, **Graciosa**, **Laval**, **Pico**, **Flores**, and **Corvo** All these islands enjoy a very clear sky and salubrious air they are extremely fertile in corn, wine, and a variety of fruits, and they breed large quantities of cattle The wine called **Fayal** is chiefly raised in the island of **Pico**, which lies opposite to **Fayal** and is the largest of all the **Azores** About 20,000 pipes of this wine are made yearly These islands have greatly suffered by earthquakes They were first discovered by **Martin Behaim**

**AZORIAN FENNEL** See **LIMONCHIO**

**AZOT** (a *otum* from a priv and *zer*, to live because it is unfit for respiration) **Azot** Philo-sophized in **M** **Phitic** an **Nitrogen** **Mercurien** **Molette** A tasteless and moderate element very important in chemistry which is never found completely separate from every other substance, except in the state of gas It is considered as a simple body, having never been decomposed and is inconsumable It is somewhat lighter than atmospheric air, its specific gravity being according to **Scheele** 00120 and according to **Lavoisier** 00115 This substance exists very abundantly in nature, forming the greater part or about three fourths of the atmosphere the peculiar and almost characteristic ingredient of animal matter, the basis of the nitric acid and one of the constituents of the volatile alkali

Pure **azot** or **azotic gas** is synonymous with the philosophized air of **Scheele** and **Philetas** the stoichiometrical nomenclature of **Lavoisier** and the nitrogen gas of **Chaptal** and some other French chemists

The distinguishing characteristic of animal substances, as opposed to vegetable, is the possession of a prodigious predominance of **azot** or nitrogen compared with the carbon while vegetable substances possess in equal superiority of carbon over their proportion of **azot** Pure vegetable matters perhaps contain no **azot** whatever It is from the abundance of **azotic gas** is exhibited by the decomposition of nitre or in other words the vast proportion of it that enters into its make, that **azot** derives the name of nitrogen

This gas may be procured by several different processes, and by all the methods which have been used in **anatomy** or the analysis of common air If a quantity of iron filings and sulphur, mixed together, and moistened with water be put into a glass vessel full of air, and inverted over water it will absorb all the oxygen in the course of a few days, but a considerable residuum of air will still remain incapable of further diminution this is **azotic gas**, though not perfectly pure If phosphorus be used instead of iron filings and sulphur, the effect takes place more speedily, the absorption

## A Z U

being completed in less than twenty four hours. Berthollet's method, if cautiously employed, will yield very pure gas. Very dilute nitric acid is poured upon a piece of muscular flesh, or the coagulum of blood, and a gentle heat of about 100° Fahrenheit is applied. The animal matter gives out in considerable quantity, and great purity, azotic gas, which may be received in vessels contrived for the purpose, and which are described under the article *CRAS*.

The principal qualities of azotic gas are as follow. It is invisible and elastic like common air, and capable, like it too, of indefinite condensation and expansion. It immediately extinguishes a lighted candle and all other burning substances, hence the reason why a candle is extinguished in atmospherical air, as soon as the oxygen near it is consumed. It has no sensible taste, but is exceedingly noxious to animals, if compelled to respire it, they drop down dead almost instantly, some plants, however, live in it and even flourish. It is not absorbed by water, but is capable of combining with oxygen, and with different proportions of this substance forms atmospherical air, gaseous oxyd of azot, or nitrous oxyd, nitrous gas, nitrous acid, and nitric acid as may be seen under their names. It is capable of dissolving sulphur, phosphorus, and charcoal in minute quantities. It unites to hydrogen under certain circumstances and constitutes, with it ammonia. Very little is known concerning the action of azot in its simple form upon metallic or saline substances, and in the state of gas it appears to be more inactive and unwilling to enter into combination than any other substance in nature. It was discovered in 1772, by Dr Rutherford, of Edinburgh, and many of its properties were ascertained by Cavendish, Kirwan, and Priestley.

**AZOT** (Gaseous oxyd of) See **NITROUS OXYD**.

**AZURI** *a* (*azur*, French) Blue, sunt blue (*New ton*)

**AZURE**, in mineralogy and the arts, a name

## A Z Y

formerly applied to lapis lazuli, or azure stone, and the blue colour prepared from it, but is now used to denote the blue extracted from cobalt. The former is generally called ultramarine, and the latter has also the name of smalt.

**AZURE DE CUIVRE**, or **MOUNTAIN BLUE**, an ore of copper, containing that metal in a state of combination with the carbonic acid, and therefore technically denominated blue carbonat of copper.

**AZURE** in heraldry, the blue colour in the arms of any person below the rank of a baron. In the escutcheon of a nobleman, it is called sapphire, and in that of a sovereign prince, Jupiter. In engraving this colour is expressed by lines or strokes drawn horizontally. This colour may signify justice, perseverance, and valiance, when compounded with

Or	} it signifies	{	Chastity
Arg			Vigilance
Gu			Recluse
Ver			Enterprise
Pur			Goodness
Sab			Mourfulness

**AZURITE** See **LAZULITE**.

**AZYGOS** (*αζυγος*, from *α*, priv and *ζυγος*, a yoke, because it has no fellow) Several muscles, veins, bones &c are so called on this account.

**AZYCOS VEIN** *Vena azygos* Vena sine pari. This vein is situated in the right cavity of the thorax upon the dorsal vertebrae. It receives the blood from the vertebral, intercostal, bronchial, pericardiac and diaphragmatic veins, and evacuates it into the vena cava superior.

**AZYMITIS** in theology, the who communicate in bread not leavened, or fermented. This appellation is given by Cerialius to those of the Latin church, upon his excommunicating them in the eleventh century.

**AZYMOUS** *a* Unfermented, or made without leaven or unleavened bread. Sacrament is of this kind.



# B.

## B

## B A A

**B**, THE second letter of the English and most other alphabets. It is the first consonant, and first mute, and its pronunciation is supposed to resemble the biting of a sheep. B is also one of those letters which are called labial, because the principal organs employed in its pronunciation are the lips. It is pronounced by pressing the whole length of them together, and forcing them open with a strong breath. It has a near affinity with the other labials P and V, and is often used for P by the Armenians and other orientals, as in *Betrus* for *Petrus*.

As a numeral, B was used by the Greeks and Hebrews to denote 2, but among the Romans for 300, and with a dash over it (thus *B̄*) for 3000.

B is also used as an abbreviation. Thus B A stands for bachelior of arts, B I for bachelior of laws, and B D for bachelior of divinity. B I in the preface to the decrees, or senatus consulta of the old Romans signified *bonum factum*. In music B stands for the tone above A as B♭, or <sup>♭</sup>B, does for B flat, or the semi tone major above A. B also stands for bass, and B C for *lasso continuo*, or thorough bass.

B and P have so near a relation one to another, that Quintilian tells us that in *altinuit* reason requires a *b*, while in fact we hear the sound of *p*, as *optinuit*. This is the cause that in ancient inscriptions and old glossaries these two letters are often put one for the other, as *apsent*, for *absent*, *obtinus*, for *optinus*, *pleps*, for *plebs*, *poplicus*, for *pullicus*, and the like. Hence it is, that we still write *suppono* for *sulpono*, *oppono* for *obpono*, and several nations often pronounce one of these letters for the other, as the Germans who say, *ponum vinum*, for *lonum vinum*, and the like.

The Greeks often change these two letters one for the other, and Plutarch assures us it was usual with the priests of Delphos to say, *βαλειν* for *παλειν*, and *βινειν* for *πινειν*. From whence it comes to pass, that as often as it follows an *s*, we still change *b* into *p*, *scribo*, *scripsi*, as the Greeks say, *λειβω*, *λεψω*, &c. B, says Priscian, can never be put before S in any syllable.

It is in conformity to this use that the Latins have taken *paseo* from *πασειω*, *papea* from *παπειν*, *bucus* from *πυξω*, *pedo* from *πειδω*, *puleus* from *πυλειω*, and the like, as the Greeks have taken *πυργω*, *turris*, from the Phoenician word *bourg*.

It is also common to these two letters to creep into words without occasion, as *absparto* for *asparto*, *alstendit* for *ostendit*, *alstentui* for *ostentui*, and hence it comes, that from *uere*, we say *comlureuere* and according to Nonnius, *celclie* is used for *celire*.

B has also a great similitude with V consonant and hence it is, that when words are changed into another language they are often tal en one for another, as *βινε* *vinc* *βινε* *vinc*, *βινω* *colo*, *βαινα* *cento*, *βινδω* *indudo* *βασκα*, *βενειν* *βη*, *βη* *βη*, *βη* *βη*, *βη* *βη*, *βη* *βη*.

From hence also it comes that the Greeks sometimes translate those Latin words by a B that begin with V as *βαρνο* for *valere*.

Yet this affinity of B with V does but little favour the pronunciation of the Spaniards and Germans who always pronounce V for B and B for V.

And although this error be no small one, yet it is more incient than is commonly thought, for not only Adimantius speaks very particularly of it in Cassiodorus, but we meet with many examples of it upon old mable as *BASLE* for *VASLE*, *CIBICA* for *CIVICA*, and in like manner V is put for B, *VINI-FICIUM* for *BENEFICIUM*, *SIBL* for *SIVI*. And in the Products of Florence, *av eo* for *al eo*, *VOBFM* for *BOVEM*, *VLSIIAS* for *BESIIAS*, and the like.

But besides this resemblance that B has with V consonant, it has the same with F or Φ, for we say *Biuges* for *Fiuges*, as Cicero observes, from *βινειν* comes *fremo*, and on the contrary we say, *sifilari* for *sibilare*, from whence comes the French word *siffler* *af nolis* is used for *ab nolis*, and we still write *sufficio* for *sulfero*, *sufficit* for *sulficit*, and *suffusio* for *sulfusio*. And according to Festus, *allum* is derived of *αλλω* a sort of white scurf, or rough letter, and from *αλλω* comes *amlo*.

BA, in geography a town of Africa, in Ardren, on the Slave coast.

To BAA *v n* (*balo*, Lat.) To cry like a sheep.

BAA (from the verb.) The cry of a sheep.

BAADEN, in geography. See *BADEN*.

BAAL the same is Bel or Belus, an idol of the Chaldeans and Phoenicians, or Canaanites. The former worshipped Mars under this name, according to Josephus, who, speaking of Thurus the successor of Ninus, says, "To this Mars the Assyrians erected the first statue, and worshipped him as a god, calling him Baal." It is probable the Phoenicians worship-

## B A B

ped the sun under the name of Baal, for Jewish, willing to make some amends for the wickedness of Manasseh in worshipping Baal and all the host of heaven, put to death the idolatrous priests that burnt incense unto Baal. The temples consecrated to this god are called in the Scripture *Chamminim*, which signifies places inclosed with walls in which was kept a perpetual fire. The word *bail*, in the Punic language, signifies lord or master, and doubtless *Baal* the Supreme Deity, the Lord and Master of the universe. It is often joined with the name of some false god, as *Baal-beruth*, *Baal-peor*, *Baal zephon*, &c.

**BAAI BEKITH**, the god of the Suckemites. Bochart conjectures, that *Bekith* is the same as *Beroe*, the daughter of *Venus* and *Adoni*, who was given in marriage to *Biechus*, and that he gave her name to the city of *Bekith* in *Phœnicia*, and became afterwards the goddess of it.

**BALIM**, in ancient mythology, inferior deities among the *Phœnicians*.

**BAAI PEOR** **BAAI PHEGOR**, or **BEEL-PHEGOR** idol of the *Moabites* and *Midianites*. We are told that *Israel* joined himself to *Baal-peor*, and that *Solomon* erected an altar to this idol upon the mount of *Olives*. *Baal-peor* has been supposed to be no other than a *Priapus*, and that the worship of him consisted in the most obscene practices. *Selden* imagines that *Baal-peor* is *Pluto*, founding his conjecture on *Psalm* cvi 28 where it is said, 'They joined themselves unto *Baal-peor*, and ate the offerings of the dead.' The sacrifices to which these words refer were, as *Selden* thinks, offered to appease the manes of the dead.

**BAAI ZEBUB**, **BEEL ZEBUB**, or **BEELZEBUB**, the idol, or god of the *Ikonites*. In Scripture he is called the Prince of Devils. His name is rendered the Lord of Flies, or the God fly, which some think was a mock appellation bestowed on him by the Jews. He had a famous temple and oracle at *Ikon*. The worship of this false god must have prevailed in our Saviour's time, since the Jews accused him of driving out devils in the name of *Beelzebub* their prince.

**BAAI ZEPHON**, in scripture geography, a place opposite to *Philathroth*, where the *Israelites* encamped before they passed the Red sea. In the opinion of *Bruce* (*Travels*, vol 1 p 233), *Baal zephon* was probably some idol's temple, which served for a signal house upon the cape which forms the north entrance of the bay, opposite to *Hibbel Atrakh*, near *Suez*, where there is still a mosque or saint's tomb.

**BAAR**, a landgrave in the south west part of the circle of *Suab*.

**BAA** *Bos barbatus*. See *Bos*.

**BABA CAPL**, in geography, a cape of *Natalia* in *Asia Minor*, between the islands of *Tenedos* and *Lesbos*, near the gulf of *Adramytti*. Lat 39 33 N Lon 26 22 E.

**BABA**, the Russian name of the pelican.

**Te BA'BBLE** *u n* (*babbelen*, German)

## B A B

1 To prattle like a child (*Prior*) 2 To talk idly, or irrationally (*Prior*) 3 To tell secrets (*L'Estrange*) 4 To talk much (*Prior*).

**BA'BBLE** *s* (*babul*, Fr) Idle talk, senseless prattle (*Shakspeare*).

**BA'BBLE ME NI** *s* (from *Labble*) Senseless prate, empty words (*Milton*).

**BA'BBLER** *s* (from *babble*) 1 An idle talker (*Rogers*) 2 A teller of secrets (*Spenser*).

**BABBLER**, a hound upon whose tongue no firm reliance is to be made, either in drag, upon trail, or the recovery of a fault during the chase.

**BABT** *s* (*Lalan*, Welsh) An infant, a child of either sex (*Dryden*).

**BABI** a city and tower undertaken, as the holy Scriptures relate, to be built by the whole human race soon after the flood, and remarkable for the marvellous frustration of the attempt by the confusion of languages. Most authors are of opinion that it was situated exactly in the place where the celebrated city of *Babylon* afterwards stood. Authors have been much divided about the motive by which the whole race of mankind were induced to join in one man in such an undertaking. Oriental writers say, that the city was 313 fathom in length, and 151 in breadth, that the walls were 33 fathoms high, and 33 in breadth, and that the tower itself was no less than 10 000 fathom, or 12 miles high.

*Babel* began building 2247 before Christ, and continued building forty years, when God confounded the builders' language, and dispersed them into different nations. From thence arose the difference of languages, the dispersion of the people, and the forming of empires. From *Japhet*, *Noah's* eldest son, sprung the inhabitants of the north of Europe and Asia, as well as those of the west. From *Shem* came the people of the east, as also those of *India*, and from *Ham* descended the *Canaanites*, *Philistines*, *Egyptians*, and the ancient possessors of *Africa*. See *CONFUSION OF LANGUAGES*.

**BABLI MANDEB**, or **BABLI MANDEL**, is the gate of mourning, a famous streight in the Indian Ocean between the coast of *Arabia Felix* in Asia, and that of *Adel* and *Zeila* in *Africa*, at the entrance of the Red Sea. It is by some called the streights of *Mocha*, because *Mocha* lies on the Asiatic shore.

**BABLI MANDEL**, a small island at the mouth of the streight of *Babel Mandel*, belonging to *Ethiopia*. It is little more than a barren rock, not more than five miles in circumference. It was formerly an object of great contention between the *Ethiopians* and *Arabians*, but has been of little importance since the discovery of a passage to the East Indies by the Cape of Good Hope. Lat 12 40 N Lon 44 30 E.

**BA'BERY** *s* (from *balc*) Finery to please a babe or child (*Sidney*).

**BABINA** (Commonwealth of), a society ludicrously so called, which was founded in

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Poland in the reign of Sigismund-Augustus, in the 16th century. It took its rise from a set of gentlemen, inhabitants of Iublin, who had agreed to meet at a place called Babina, merely for the purposes of mirth and jollity. They rendered vice and folly ridiculous, by a sham promotion of certain persons to mock dignities and appointments under a fictitious commonwealth or government. Never did any institution of this nature become so general or so useful, but at length the society degenerated into a set of buffoons, and bunticks of every thing sacred or profane.

**BABISH** *a* (from *bale*) Childish (*As cham*)

**BABOON**, in zoology. See **SIMIA**

**BABUYANIS**, a cluster of six or seven small islands, about ten leagues north of the straits of Lupon, in the Pacific Ocean. One of them contains about 500 inhabitants. The chief produce is wax, ebony, bananas, coconuts, and plantains.

**BABUYCA**, a town of North America in the province of Culicum sixty-five miles NNE Culicum.

**BABUZIARIUS** (*Babuziarius* from *Babuzia*, to baffle, or speak inarticulately.) The incubus epithet or night mare so called because in this disorder the person is apt to make in inarticulate and confused noise.

**BABY** *s* (see **BABE**) 1 A child in infant (*Lock*). 2 A small image in imitation of a child (*Baron*).

**BABYLON**, the capital of the ancient kingdom of Babylon or Chaldaa, and supposed to have stood in  $1^{\circ} 44' 30''$  N lat  $33^{\circ} 20'$  S. Latitudes is said by some, and Belus by others, to have founded the city. But by whomsoever it was founded, Nebuchadnezzar was the person who put the last hand to it, and made it one of the wonders of the world. Yet it plainly appears that the city was never wholly inhabited. It never had time to grow up to what Nebuchadnezzar visibly intended to have made it, for, Cyrus removing the seat of the empire soon after to Shushin, Babylon fell by degrees to utter decay. Many of the moderns are of opinion that the extravagant descriptions given of Babylon by ancient writers are very far from being true, although it is certain that few other monuments can be brought against the reality of them, than that we do not see things of a similar kind executed in our own days.

This capital was, according to Herodotus (who was himself at Babylon), surrounded with walls, in thickness 87 feet, in height 30 feet, and in compass 480 furlongs, or 60 of our miles. It is observed, that those who give the height of these walls but at 50 cubits speak of them only as they were after the time of Darius Hystaspis, who had caused them to be beaten down to that level. These walls formed in exact square, each side of which was 120 furlongs, or 16 miles in length, and were all built of large bricks cemented together with bitumen, which in a short time grows harder than the very brick and stone which it cements.

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The city was encompassed, without the walls, with a vast ditch filled with water, and lined with bricks on both sides, and, as the earth that was dug out of it served to make the bricks, we may judge of the depth and largeness of the ditch from the height and thickness of the walls. In the whole compass of the wall there were 100 gates, that is 25 on each of the four sides, all made of solid brass. Between every two of these gates, at great distances, were three towers, and four more at the four corners of this great square and three between each of these corners and the next gate on either side, and each of the towers was ten feet higher than the walls. But this is to be understood only of those parts of the wall where towers were needed for defence. For some parts of them being upon rivers, and inaccessible by an enemy, there he labour and expense spared which, though it must have spoiled the symmetry of the whole, must be allowed to have savoured of good economy, though that is what one would not have expected from a prince who had been so determined, as Nebuchadnezzar must have been, to make the city complete both for strength and beauty. The whole number then of these towers amounted to no more than 240, whereas a much greater number would have been necessary to have made the uniformity complete all round. Upon the 20 gates in each side of the square, there was a straight street extending to the corresponding gate in the opposite wall, whence the whole number of the streets must have been but 40; but then they were each about 1½ miles long, 20 of them crossing the other 20 exactly at right angles. Besides the whole streets, we must add on four half streets which were but rows of houses facing the four inner sides of the wall. These four half streets were properly the four sides of the city within the walls and were each of them 200 feet broad the whole streets being about 150 of the same. By this interconnection of the 60 streets, the city was divided into 676 square, each of four furlongs and a half on each side, or two miles and a quarter in compass. Round these squares on every side toward the streets stood the houses, all of three or four stories in height, and beautified with all manner of ornaments, and the space within each of these squares was all void, and taken up by yards, or gardens, and the like either for pleasure or convenience.

A branch of the Euphrates divided the city into two running through the midst of it, from north to south, over which, in the very middle of the city, was a bridge a furlong in length, or rather more, and indeed much more, if we hearken to others, who say it was no less than five stades or furlongs in length though but 30 feet broad, a difference we shall never be able to decide. This bridge, however, is said to have been built with wonderful art, to supply a defect in the bottom of the river, which was all sandy. At each end of this bridge were two palaces, the old palace on the east side, the new one on the west side of the

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river, the former of which took up four of the squares above mentioned and the latter nine. The temple of Belus, which stood next to the old palace, took up another of the same squares.

The whole city stood in a large flat or plain, in a very fat and deep soil—that is, put or half of it on the east side of the river was the old city, and the other on the west was added by Nebuchadnezzar, both being included within the same square bounded by the walls above said.

Nothing was more wonderful at Babylon than the hanging garden, which Nebuchadnezzar made in complaisance to his wife Amytis, who being a Median and returning a strong inclination for the mountains and forests of her own country was desirous of having something like them at Babylon. They are said to have contained a square of four plethra or 400 feet on each side, and to have consisted of terraces one above another carried up to the height of the wall of the city, the ascent from terrace to terrace being by steps ten feet wide. The whole pile consisted of substantial arches upon arches and was strengthened by a wall surrounding it on every side, twenty-two feet thick and the floors on each of them were laid in this order: first, on the tops of the arches was laid a bed or pavement of stones sixteen feet long and four feet broad, over this was a layer of reed mixed with a great quantity of bitumen and over this two courses of brick closely cemented together with plaster and over all the cover thick sheets of lead, and on these the earth or mould of the garden. This floor was designed to retain the moisture of the mould, which was so deep, as to give root to the greatest tree which were planted upon every terrace together with great variety of other vegetables pleasing to the eye. Upon the uppermost of these terraces was a reservoir, supplied by a certain engine with water from the river from whence the gardens on the other terraces were supplied.

The other works attributed to Nebuchadnezzar by Berosus and Abydenus, were the bulks of the river, the artificial canals and the great artificial lake said to have been sunk by Semiramis. The canals were cut out on the east side of the Euphrate, to convey the waters of that river when it overflowed its banks into the Tigris before they reached Babylon. The lake is on the west side of Babylon, and, according to the lowest computation, 40 miles square, 100 in compass, and in depth 35 feet, as we read in Herodotus, or 75, is Megathene will have it, the former, perhaps, measured from the surface of the sides, and the latter from the tops of the bulks that were cast upon them. This lake was dug to receive the waters of the river while the banks were building on each side of it. But both the lake, and the canal which led to it, were preserved after that work was completed, being found of great use, not only to prevent all overflowings, but to keep water all the year, in a common reservoir, to be let out, on proper

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occasions, by sluices, for the improvement of the land.

The banks were built of brick and bitumen, on both sides of the river, to keep it within its channel, and extended on each side throughout the whole length of the city, and even farther, according to some, who reckon they extended 160 furlongs or twenty miles, whence it is concluded they must have begun two miles and a half above the city and have been continued an equal distance below it, the length of the city being no more than 15 miles. Within the city they were built from the bottom of the river and of the same thickness with the walls of the city itself. Opposite to each street, on either side of the river, was a brazen gate in the wall, with stairs leading down from it to the river; these gates were open by day, and shut by night.

BABYLON in scripture history, is a name figuratively given by the sacred writers, especially by St Peter (1 Pet. ch. v. 13) and by St John (Revelations ch. xvii and xviii) and likewise by the fathers, to Rome, partly on account of her extreme pride and oppression of God's people and partly for her resemblance to the ancient Babylon in idolatry, that kingdom so fully representing the idolatry of the church of Rome in the description given of it in the sixth chapter of Birch that scarcely any real difference between them can be observed. Whitt's Paraphrase, vol. ii. p. 661 and 773.

BABYLONIA, or CHALDEA a kingdom of Asia and the most ancient in the world, being founded by Nimrod the grandson of Ham who also, according to the margin of our bibles founded Nineveh the capital of the kingdom of Assyria. Nothing certain is known concerning either of these, except what may be gathered from scripture.

BABYLONIAN BABYONIUS is used in ancient writers for an astrologer, or any thing relating to astrology.

BABYONIC A TITIA, a rich sort of weavings or hangings denominated from the city of Babylon, where the practice of interweaving divers colours in their hangings first obtained. Hence also Babylonian garments, Babylonian skins.

BABYLONICS, BABYONICA, a fragment of the ancient history of the world, ending at 267 years before Christ, and composed by Berosus or Berossus a priest of Babylon, about the time of Alexander. Babylonics are sometimes also cited in ancient writers by the title of Chaldees. The Babylonics were very consonant with scripture, as Josephus and the ancient Christian chronologists assert, whence the author is usually supposed to have consulted the Jewish writers. Berosus speaks of an universal deluge an ark, &c.

BABYRUSSA, a species of the genus SIMA, which see. Inhabits the islands of the Indian Ocean, is gregarious, feeds on herbs and leaves, is of quick scent, swims and dives well, grunts, is of the size of a stag, and its flesh good for food.

## • B A C

**BAC**, in navigation, is used for a praam, or ferry-boat

**BAC**, or **BAC**K, in brewing, a large flat kind of tub, or vessel, wherein the wort is put to stand and cool before boiling. The ingredients of beer pass through three kinds of vessel. They are mashed in one, worked in another, and cooled in a third called chub, or cooler.

**BACANLIBI** in ecclesiastical history, wandering clerks who strolled from church to church.

**BACCA** (from *Bacchus*, the inventor of wine, or rather from בָּכָה, *bacca*, Heb.) A berry.

**BACCA BLERUDLÉN'S** See **SAPONARIE NUCULÆ**.

**BACCÆ NORLANDICÆ** The fruit of the rubus arcticus, folius alternatis, cule meum unifloro of Linnæus. They are recommended by Linnæus as possessing antiseptic, refrigerant, and antiscorbutic qualities.

**BACCARACH** a town of the lower palatinate of the Rhine, in Germany, famous for its wine. Lat 49 33 N. Lon 7 52 E.

**BACCARIS** Ploughman's spikenard. In botany, a genus of the class syngenesia, order polygamia superflua. Receptacle naked, down simple calyx unbricate cylindrical, female florets intermixed with the hermaphrodite florets. Fourteen species spread over Asia, Africa, and America, many of which are propagated in our own gardens by cuttings or seeds. The cuttings should be planted on a shady border during the summer months, but the seeds should be sown in the spring. These shrubs if planted in a warm situation will live abroad in mild winters, but they are usually placed in green houses, and only entrusted abroad during summer.

**BACCAFFID** a (*Iaccatus*, Lat.) Beset with pearls, having many berries.

**BACCHANALIA**, **BACCHANALS**, celebrated in honour of the god Bacchus, and which were called liberales, or orgie, or dionysia.

The orgie, bacchanals, liberales, and dionysia are usually taken for the same, but there was a difference between the pagan ceremonies, for the feasts of liber, or liberti, were celebrated in honour of Liber or Bacchus every year on March the 17th, when the young men between 16 and 17 years old put off their garment bordered with purple, called pretexta, to take the toga virilis from the hands of the prætor with a surname, which made them capable of going to the war, and of the office of the commonwealth. But the bacchanals were kept every month, and the dionysia or orgie every three years, which gave them the name of trieterica.

Macrobius, in the first book of his Saturnalia, chapter 18, having proved by good reasons that Bacchus and Apollo are but one thing, adds, that the bacchanals were celebrated every two years upon mount Parnassus, dedicated to Apollo and the Muses, where the Satyrs assisted.

Authors refer the institution of the feast of Bacchus to the Athenians, which passed at first

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for very honest plays, and merriments among the pagans. They carried a barrel of wine wound about with vine-branches loaded with grapes. They drew an he goat by the horns, to sacrifice him with a basket full of figs and grapes, having their heads crowned with vine branches, and the bacchæ, which were the priests of this god, held in their hands staves twisted with ivy, dancing and wantonly playing in the streets, and crying evocate, that is to say, a happy life.

But these feasts were in length of time changed into a licentious use of all sorts of debauchery.

The bacchanalia were introduced into Rome by a stage player from Lucania, and in a short time newly invented in indecency and obscenity those observed in Greece. Two of these feasts were particularly remarkable, and distinguished by the epithets greater and less. The latter were held in the open fields during the autumn, but the former in the city, about the vernal equinox.

**BACCHANATIAN**s (from *bacchanalia*, Latin) A drunkard.

**BACCHANALS**s (*bacchanalia*, Lat.) The drunken feasts of Bacchus (*Pope*).

**BACCHANILES**, priestesses of Bacchus, who are represented at the celebration of the orgies almost naked, with garlands of ivy, with a thyrsus and dishevelled hair. Their looks are wild and they utter dreadful sounds, and chime different musical instruments together. They are also called Thyiades and Menades (*Quid &c*).

**BACCHIARIS** See **BACCARIS**.

**BACCHI**, in mechanics, a kind of ancient machines, in form of goats, used by Jupiter in his wars against the giants. Rudbeck describes two kinds of bacchi, one made like the buttering run, wherewith Jupiter demolished the enemy's fortifications, the others contrived to cast fire out of, from whence the Greeks are conjectured to have framed their idea of chimera.

**BACCHIS** or **BATHUS**, king of Corinth, succeeded his father Prumnides. His successors were always called bacchides, in remembrance of the equity and moderation of his reign. The bacchids increased so much, that they chose one of their number to preside among them with regal authority. Cyprius overturned this institution, by making himself absolute (*Stat*).

**BACCHIUS** and **BATHUS**, two celebrated gladiators of equal age and strength, whence the proverb to express equality, Bathus contra Bacchium (*Horat*).

**BACCHIVS**, in ancient poetry, a kind of foot composed of a short syllable and two long ones, as the word *avari*. It takes its name from the god Bacchus, because it frequently entered into the hymns composed in honour of him.

**BACCHUS**, in mythology, was son of Jupiter and Semele, the daughter of Cadmus. After she had enjoyed the company of Jupiter, Semele was deceived, and perished by the arti-

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fice of Juno, who assumed the shape of Beroë, Semele's nurse, and persuaded Semelë that the lover whom she entertained was not Jupiter, but a false lover, and that to prove his divinity she ought to beg of him, if he really were Jupiter, to come to her bed with the same majesty as he courted the embraces of Juno. The artifice succeeded, and when Jupiter promised his mistress whatever she asked, Semele required him to visit her with all the divinity of Jove. Jupiter was unable to violate his oath, and Semelë, unwilling to retract it, therefore, as she was a mortal, and unable to bear the majesty of Jupiter, she was consumed, and reduced to ashes. The child, of which she had been pregnant for seven months, was with difficulty saved from the flames, and put in his father's thigh, where he remained the full time he naturally was to have been in his mother's womb. From this circumstance Bacchus has been called *Bimater*. There are different traditions of the manner of his education, which shew that there have been many of the same name. Diodorus speaks of three of this name, and Cicero of a greater number, but among them all, the son of Jupiter and Semele seems to have obtained the merit of all the rest. This personage is seldom named in modern times but is a sensual encourager of feast and jollity, but he is regarded in a more respectable light by the ancients who worshipped him in different countries under the following appellations: in Egypt, he was called Osiris; in Mysia, Fraxos; in India, Dionysius, Liber, throughout the Roman dominions, Adonius, in Arabia, and Pentheus, by the Lucanians. Mythologists furnish reasons for all these different names given to the same god, which may be seen in the second volume of *Bauiers Mythology*.

It is natural to suppose that the Greeks and Romans, as usual, bestowed upon the one Bacchus which they worshipped the several actions and attributes of the many divinities known by that name, and by other equivalent denominations in different countries. However, antiquity chiefly distinguished two gods under the title of Bacchus: that of Egypt, the son of Ammon, and the same as Osiris, and that of Thebes in Bactria, the son of Jupiter and Semelë.

The Egyptian Bacchus was brought up at Nysa, a city of Arabia Felix, whence he acquired the name of Dionysius, or the god of Nysa, and this was the conqueror of India. Though this Bacchus of the Egyptians was one of the elder gods of Egypt, yet the son of Semelë was the younger of the Grecian deities. Diodorus Siculus tells us, that Orpheus first deified the son of Semelë by the name of Bacchus, and appointed his ceremonies in Greece, in order to render the family of Cadmus, the grandfather of the Grecian Bacchus, illustrious.

The great Bacchus, according to sir Isaac Newton, flourished but one generation before the Argonautic expedition. This Bacchus, says Heronippus, was potent at sea, conquered

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eastward as far as India, returned in triumph, brought his army over the Hellespont, conquered Thrace, and left music, dancing, and poetry, there. And, according to Diodorus Siculus, it was the son of Semelë who invented farces and theatres, and who first established a music-school, exempting from all military functions such musicians as discovered great abilities in their art, on which account, says the same author, musicians formed into companies have since frequently enjoyed great privileges.

Dr Burney observes, that the dithyrambics which gave birth to dramatic representations, are as ancient as the worship of Bacchus in Greece, and there is little doubt that the ceremonies of his mysteries gave rise to the pomp and illusions of the theatre. Many of the most splendid exhibitions upon the stage for the entertainment of the people of Athens and Rome being performed upon the festivals of Bacchus, gave occasion to the calling all those that were employed in them, whether for singing, dancing, or reciting, servants of Bacchus.

**BACCHUS ROSE** A flower, not tall, but very full and broad-leaved (*Wortimer*)

**BACCIFEROUS** a (from *bacca* and *fero*, Lat.) Berry bearing (*Ray*)

**BACCINIUM**, in antiquity a basin or vessel to hold water for washing the hands.

**BACH** (Johann Sebastian), an eminent German musician, was born at Eisenach in 1685. At the age of 19 he was chosen organist of the new church of Arnst. In 1708 he became musician to the duke of Saxe Weimar, and obtained a victory at Dresden over a famous French organist, who had challenged all the German musicians. He is reckoned to have been equal to Hindel on the organ, and his composition are in the first style of excellence. He died at Leipzig in 1754. His sons, Charles, Emanuel, and John, were also greatly celebrated as performers and composers in music, the former was living at Hamburg in 1773, and the other was in England in 1763 (*Wal*).

It was observed by Abel, that if Sebastian Bach, and his admirable son Emanuel, instead of being music directors in commercial cities, had been employed to compose for the stage and public of great capitals, such as Naples, Paris, or London, and for performers of the first class, they would doubtless have simplified their style more to the taste of their judges, and would have been among the greatest musicians of the eighteenth century.

**BACHELOR**, or **BATCHFLOR**, a common term for a man not married, or who is yet in a state of celibacy. The Roman censors frequently imposed fines on old bachelors. Dion of Illicarnassus mentions an old constitution by which all persons of full age were obliged to marry. But the most celebrated law of this kind was that made under Augustus, called the *Lex Julia de maritandis ordinibus*, by which bachelors were made incapable of legacies or inheritances by will, unless from their near relations. The Rabbins maintain,

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that, by the laws of Moses, every person, except some few, are obliged in conscience to marry at twenty years of age: this makes one of their 613 precepts. Hence those maxims so frequent among their casuists, that he who does not take the necessary measure to leave heirs behind him, is not a man, but ought to be reputed a homicide. Lycurgus was not more favourable by his laws, bachelors are branded with infamy. In England, there was a tax on bachelors, after 20 years of age, 1*l* 10*s* for a duke, a common person 1*s* by 7 Will III 169. In Britain, at present they are taxed by a double duty on their male servants. Thus every man of the age of 21 years and upwards never having been married who shall keep one male servant or more, shall pay 1*l* 10*s* for each above or in addition to the ordinary duties leviable for servants.

**BACHELOR** was anciently a denomination given to those who had attained to manhood, but had not a number of vassals sufficient to have their banner carried before them in the field of battle, or, if they were not of the order of bannerets, were not of age to display their own banner, but obliged to march to battle under another's banner. It was also a title given to young cavaliers who, having made their first campaign, received the military grade accorded to them. And it served to denominate him who had overcome another in a tournament the first time he ever engaged.

There is scarcely any word whose origin is more controverted among the critics than that of bachelor, baccellarius, or baccellarius, the two different acceptations of the word, literary and military, above recited, have each of them their advocates who assert each to be the primitive sense, and derive the word accordingly.

Among those who hold the military bachelor to be the more ancient, is Cujas, who derives the word from *baccellarius*, a kind of cavalry, anciently in great esteem. Du-Cange deduces it from *baccallari*, a kind of fecs, or farms, consisting of several pieces of ground, each whereof contained 12 acres or as much as two oxen would plough, the possessor of which *baccallaria* were called *bachelors*.

Caseneuve, and Altaserrus derive bachelor from *baculus*, or *bacillus*, a staff, because the young cavaliers exercised themselves in fighting with staves. Mastrucius derives it from *baccalaureus*, i. e. *bacca laurea donatus* in allusion to the ancient custom of crowning poets with laurel *bacca laurea* as was the case with Petrarch at Rome in 1311. Alciat and Vives are of the same opinion: nor is this etymology improbable.

**BACHELORS**, in the livery companies in London are those not yet admitted to the livery. The companies generally consist of a master, two wardens, the livery, and the bachelors, who are yet but in expectation of dignity in the company, and have their function only in attendance on the master and wardens: they are also called yeomen.

**BACHELORS**, *knights*, were so called, as

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being the lowest order of knights, or inferior to bannerets.

**BACHELORS**, in a university sense, are persons that have attained to the *bacca laurea*, i. e. or who have taken the first degree in the liberal arts and sciences. Before a person can be admitted to this degree at Oxford, it is necessary that he study there four years, three years more may entitle him to the degree of master of arts, and in seven years more he may commence bachelor of divinity. At Cambridge the degrees are usually taken much the same as at Oxford: excepting in law and physic, in either of which the bachelors' degree may be taken in six years. In France, the degree of bachelor of divinity is attained in five years study, that is, in two years of philosophy, and three of divinity.

**BACHELOR**, in music, one who has taken his first degree in music. A qualification formerly required of a candidate for this honour, was the being able to read and expound certain books in Boethius a Greek writer on the science of the sixth century. It is now required of the candidate to compose an exercise for voices and instruments, in six parts, which exercise must be publicly performed in the music school, or other place in the university.

**BACCHICORSHIP** (from *bachelor*.) The condition of a bachelor (*Shakespeare*).

**BACILLUS PHTIS** A celebrated medicine in France for the cure of dropsies. Their principal ingredient is the extract of the *melampodium* or black hellebore.

**BACHIAN** one of the Molucca, or Clove islands, in the East Indies. Lat 0 20 S Lon 125 5 E.

**BACILLARIA** In zoology, a genus of the class vermes, order infusoria. Body consisting of cylindrical, straw-like filaments placed parallel to each other, and frequently changing their position. One species only—*b. paradox*. Found on the ulva latissima (a species of the order alga or flga), body composed of from five to forty linear yellowish short filaments, united together, forming themselves into a square, zigzag, or extended line, but always preserving their parallelism and resting in a

**BACK** *s* (bre, bice, Sixon) 1 The hinder part of the body. 2 The outer part of the hand when it is shut opposed to the palm (*Donne*). 3 Part of the body which requires clothes (*Locke*). 4 The rear (*Clarendon*). 5 The place behind (*Druiden*). 6 The part of any thing out of sight (*Bacon*). 7 The thick part of any tool opposed to the edge (*Asluthnot*).

**BACK** *ad* (from the noun) 1 To the place whence one came (*Ridgely*). 2 Backward (*Addison*). 3 Behind, not coming forward (*Blackmore*). 4 Toward things past (*Burnet*). 5 Again, in return (*Shakespeare*). 6 Again, a second time (*Dryden*).

**To BACK** *v a* 1 To mount a horse (*Shakespeare*). 2 To break a horse (*Rosc*). 3 To place upon the back (*Shakespeare*). 4



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To maintain, to strengthen (*South*) 5 To justify, to support (*Boyle*) 6 To second (*Dryden*)

**BACK**, in the manage and among furriers, is a common term of peculiar meaning. A horse's back to be good and valuable should be straight instead of hollow, which last is called saddle-bled. Saddle-backed horses are generally light and carry their heads high but are deficient in strength and service. A horse with a weak back is apt to stumble.

**Back-galled**. This is an excoriation of the hair and cuticle to which horses (and especially young ones) are very subject from being ridden too far, and too speedily, or which is more commonly the case, from carrying a saddle that does not fit the back, and consequently presses more in some parts than in others. In the last case it may be observed before the excoriation is actually produced by noting that certain parts of the back under the saddle are more violent swelled than other parts. The disease is to be avoided by avoiding the causes. The saddle that best agrees with a young horse should be easy and pretty large in the seat, and the pommel and stuffing should so far correspond with the shape of the back that the saddle may press equably upon every part at the same time.

If the gill be produced on a journey, and the horse cannot be rested till it have healed, the crupper should be altered a hole or two every morning till the saddle is drawn so far backward as to vary the seat of chief pressure. At the same time the horse's back should be cooled every time he is bled, washed with warm water, salt and water with extract of sassafras, or, as it is now called, aqua lithargyræ acetariæ, or with alcohol and water. Under this regimen with care the excoriation will heal in the midst of travelling, provided the original cause be not persevered in, in other words, that the saddle be not suffered to press in unequal pressure, or the load be not continued excessively.

**To BACK-BITE** *v a* (from *back* and *bite*) To censure or reproach the absent (*Shelton*)

**BACK-BITER** *s* (from *back* and *bite*) A person who censure or reproach the absent (*South*)

**BACK-BONE** *s* (from *back* and *bone*) The bone of the back. See **VERTEBRÆ**.

**BACK-CARRY** *s* The act of having on the back (*Cowley*)

**BACK-DOOR** *s* (from *back* and *door*) The door behind the house (*Hutchins*)

**BACKID** *a* (from *back*) Having a back (*Dryden*)

**BACKLISH** *s* (from *back* and *friend*) An enemy in secret (*South*)

**BACKGAMMON** *s* (from *back* and *gammon*, Welsh, a little battle) An ingenious and interesting game, of uncertain origin, played by two persons with a box and dice, upon a square board divided into two parts, upon which are placed twelve white and twelve black points or divisions. Each adversary has fifteen men or counters, those of the one white and of the other black by way of distinction, which are to be thus

## B A C

situated. If the player play into the right hand table, two are to be placed on the ace point in his adversary's table, five upon the cinque point in the opposite table, three upon the cinque point in the hithermost table, and five on the cinque point in his own table. His adversary's men are to be placed exactly opposite his own, and the grand object for either is to bring the men that respectively belong to them round into their own tables. All throws that contribute towards this and prevent the adversary from doing the same are advantageous, and *vice versa*.

*Directions for playing all the throws on the dice at setting out, whether for a gammon, or single hit, in which the reader must observe that the mark † implies for a gammon only, and the mark \* a hit only.*

1 Let the player play two aces on his cinque-point and bar point for either gammon or hit.

2 Two sixes are to be played on his adversary's bar point, and on his own bar point, for a gammon, or hit.

3 \* Two threes, two to be played on his cinque-point, and the other two on the trois point in his own tables, for a gammon only.

4 † Two deuces to be played on the quatre-point in his own tables, and two to be brought over from the five men placed in his adversary's tables, for a gammon only.

5 † Two fours to be brought over from the five men placed in his adversary's tables, and to be put upon the cinque point in his own tables, for a gammon only.

6 Two fives to be brought over from the five men placed in his adversary's tables, and to be put upon the trois point in his own tables, for a gammon, or hit.

7 Six ace, let him here take his bar point, for a gammon or hit.

8 Six deuce, a man to be brought from the five placed in his adversary's tables, and to be placed on the cinque point in his own, for a gammon or hit.

9 Six and three, a man to be brought from his adversary's ace-point, as far as he will go, for a gammon or hit.

10 Six and four, a man to be brought from his adversary's ace point, as far as he will go, for a gammon, or hit.

11 Six and five, a man to be carried from his adversary's ace point, as far as he can go, for a gammon or hit.

12 Cinque and quatre, a man to be carried from his adversary's ace point, as far as he can go, for a gammon, or hit.

13 Cinque trois, let him make the trois-point in his tables, for a gammon or hit.

14 Cinque deuce, play two men from the five placed in your adversary's tables, for a gammon, or hit.

15 \* Cinque-ace, bring one man from the five placed in your adversary's tables for the cinque, and play one down on the cinque point in your own tables for the ace, for a gammon only.

16 Quatre trois, bring two men from the five placed in your adversary's tables, for a gammon, or hit.

17 Quatre deuce, make the quatre-point in your own tables, for a gammon, or hit.

18 † Quatre-ace, play a man from the five placed in your adversary's tables for the quatre, and for the ace play a man down upon the cinque-point in your own tables, for a gammon only.

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19 *Trou-deuce*, bring two men from the five placed in your adversary's tables, for a gammon only

20 *Trois-ace*, make the cinque-point in your own tables, for a gammon, or hit

21 \* *Deuce-ace*, play one man from the five placed in your adversary's tables for the deuce, and for the ace play 1 man down upon the cinque-point in your own tables, for a gammon only

22 \* *Two trois*, play two of them on the cinque-point in your own, and with the other two take the quatre-point in your adversary's tables

23 † *Two deuces*, play two of them on the quatre point in your own and with the other two take the trois-point in your adversary's tables

By playing the two foregoing cases as directed the player avoids being shut up in his adversary's tables, and has the chance of throwing high doublets, to win the hit

24 \* *Two fours*, two of them are to take your adversary's cinque point in his tables, and for the other two bring two men from the five placed in your adversary's tables

25 \* 1 *Cinque ace*, play the cinque from the five men placed in your adversary's tables, and the ace from your adversary's ace point

26 \* 2 *Quatre ace*, play the quatre from the five men placed in your adversary's tables, and the ace from those on your adversary's ace point

27 \* 3 *Deuce ace*, play the deuce from the five men placed in your adversary's tables, and the ace from your adversary's ace-point

The three last chances are to be played in this manner, because, by laying an ace down in your adversary's tables, you have a probability of throwing deuce ace, trois deuce, quatre trois, or six-cinque, in two or three throws, in any of which cases you are to make 1 point which gives you the better of the hit, and observe by the directions given in this chapter that you are to play nine chances out of the thirty-six in a different manner, for a single hit, to what you would do when playing for a gammon

*Hints and cautions*—By the rules given to play for a gammon, you are voluntarily to make some blots, the odds being in your favour that they are not hit, but should that happen, and you have three men in your adversary's tables you must endeavour to secure your adversary's cinque, quatre, or trois point, to prevent a gammon, and must be very cautious how you suffer him to take up a fourth man. Take care not to crowd your game, by putting many men either upon your trois or deuce point in your own tables, which is, in effect, to lose those men by not having them in play. Besides, by crowding your game, you are often gammoned, as when your adversary finds your game open, by being crowded in your own tables he may then play as he thinks fit

The following calculations will show the odds of entering a single man upon any certain number of points, and also give you the odds for and against being hit by double dice, consequently you can choose the method of play most to your advantage. If it be necessary to make a run, in order to win a hat, and you would know who is forwardest, begin with reckoning how many points you must have to bring home to the six-point in your tables the man that is at the greatest distance, and do the like by every other man abroad, when the numbers are summed up, add for those already on your own tables (supposing the men

that were abroad as on your six point for bearing) viz six for every man on the six, and in like manner respectively for the whole. Compare this with your adversary's numbers, and you will form a true statement of the game. The first best throw upon the dice is esteemed aces, as it stops the six point in the outer table, and secures the cinque in your own, whereby your adversary's two men upon your ace point cannot get out with either quatre, cinque or six. Whence this throw is an advantage frequently asked and given between players that are not equally skilful

By the ensuing tables it will appear, that the numbers which may be thrown with two dice are 294, that the chances upon two dice are 36, and consequently that the mean number you may expect with every throw is about 8

The numbers may be calculated thus

1 Aces	4	5 and 4 twice	18
2 Deuces	8	5 3	16
2 Trois	12	5	14
2 Fours	16	5	12
2 Fives	20	4	14
2 Sixes	24		12
6 and 5 twice	22	4	10
	20		10
	18		8
			6
	14		—Points
Divided by 36			{ 294 } 8
			{ 288 }

294 divided by 36, shows that one throw with another you may expect 8 upon two dice

The chances upon two dice are as follow

2 Sixes	1	5 and 4 twice	2
2 Fives	1	5 3	2
2 Fours	1	5 2	2
2 Trois	1	* 5 1	2
2 Deuces	1	4 3	2
2 Aces	1	4 2	2
6 and 5 twice	2	* 4 1	2
6 4	2	3	2
6 3	2	* 3 1	2
6 2	2		2

To find out by this table what are the odds of being hit upon a certain or flat die, look in the table where the mark \* will indicate it

* 2 Aces	1	* 3	1 twice	2
* 6 and 1 twice	2	* 4	1	2
* 5 1	2	* 2	1	2

Total 11

Which deducted from 36

The remainder is 25

By this it appears, that it is 25 to 11 against hitting an ace, upon a certain, or flat die. The like method may be taken with any other flat die, as with the ace

Q What are the odds of entering a man upon 1, 2, 3, 4, or 5 points?

		Answer		Reduced	
To enter it	{ upon 1 point is 11 to 25 } 2 3 4 5	{ for against } 20 27 32 35	{ or about } 16 9 4 1	{ for against } 5 to 9 4 3 8 35	{ to } 9 4 1 1 1

# BACK GAMMON

What are the odds of hitting, with any chance, in the reach of a single die?

od	Answer for			or about	Reduced for		
	is	against	to		to	against	
upon 1	11	25			4	9	
2	12	24			1	2	
3	14	22			2	3	
4	15	21			5	7	
5	15	21			5	7	
6	17	19			8	9½	

What are the odds of hitting with double dice?

upon	Answer for			or about	Reduced for		
	is	against	to		to	against	
8	6	30			1	5	
9	5	31			1	6	
10	3	33			1	17	
11	2	34			1	35	
12 (or 2 sixes)	1	36			1	35	

The table of the 36 chances shows the odds of being hit on any certain or flit die the following shows the odds of being hit on a six

2 Sixes	1	6 and 3 twice	2
2 Tro s	1	6 2	2
2 Deuces	1	6	
6 and 5 twice	2	5 1	2
6 and 4 twice	2		

Which deducted from 36

Remainder is 19

That is 19 to 17 against hit upon a 6

The odds of 2 love are about 5 to 2

and of 2 to 1 is 2 1

and of 1 love is 3 2

If you play three up, your principal object in the first place, is, either to secure your own or your adversary's cinque point, when that is effected you may play a pushing game, and endeavour to gammon the adversary. The next best point (after you have gained your cinque-point) is to make your bar point, thereby preventing your adversary running with 2 sixes. After you have proceeded thus far, prefer making the quatre point in your own tables rather than the quatre point out of them. Having gained these points, you have a fair chance to gammon the adversary, if he be very forward for, suppose his tables are broken at home it will be then your interest to open your bar-point to oblige him to come out of your table with a six and having your men spread, you not only may catch that man which your adversary brings out of your tables, but will also have a probability of taking up the man left in your tables (upon supposition that he had two men here). And if he should have a blot at home, it will then be your interest not to make up your tables, because, if he should enter upon a blot, which you are to make for the purpose, you will have a probability of getting a third man, which, if accomplished will give you, at least, 4 to 1 of the gammon, whereas, if you have only two off his men up, the odds are that you do not gammon him. If you play for a hit only, one or two men taken up of your adversary's, makes it surer than a greater number, provided your tables are made up.

In bringing your men home in order to lose no point, you are to carry the most distant man to your adversary's bar-point, that being the first stage you are to place it on, the next stage is six

points farther, viz in the place where your adversary's five men are first placed out of his tables, the next stage is upon the sixth point in your tables. This method is to be pursued till all your men are brought home except 2, when, by losing a point you may often save your gammon, by putting it in the power of 2 fives or 4 fours to save it. If you play to win a hit only, endeavour to gain either your own or your adversary's cinque point, if that fails by you being hit, and he is forwarder than you, then you must throw more men into his tables, thus put a man upon your cinque or bar point, and if your adversary neglects to hit it, you may then gain a forward instead of a back game, but if he hit you, you must play for a back game, and then the greater number of men which are taken up, makes your game the better, because you by that means preserve your game at home and you must then always endeavour to gain both your adversary's ace and trois-points, or his ace and deuce-points, and take care to keep three men upon his ace-point, that if you chance to hit him from thence, that it may remain still secure to you. At the beginning of a set do not attempt a back game, as the risk is too great, since you run a chance of losing a gammon in order to win a single hit.

*Directions for the Player to bear his Men — 1* If your adversary be greatly before you, never play a man from your quatre, trois, or deuce points, in order to bear that man from the point where you put it, because that nothing but high doublets can give you any chance for the hit therefore, instead of playing an ace or a deuce from any of the aforesaid points, always play them from your highest point, by which means, throwing two fives, or two fours, will, upon having used your six and cinque points, be of great advantage whereas, had your six point remained loaded, you must, perhaps, be obliged to play at length those fives and four 2. Whenever you have taken up two of your adversary's men and happen to have two, three, or more points made in your own tables, never fail to spread your men, either to take a new point in your tables or to hit the man your adversary may happen to enter. As soon as he enters one compare his game with yours and if you find your game equal, or better, take the man if you can, because it is twenty five to eleven against him hitting you, which being so much in your favour, you ought always to run that risk, when you have already two of his men up except you play for a single hit only, and playing that throw otherwise gives you a better chance for the hit, then do not take up that man. 3. Never be deterred from taking up any one man of your adversary by the apprehension of being hit with double dice, because the fairest probability is five to one against him — 4. If you should happen to have five points in your tables, and to have taken up one of your adversary's men, and are obliged to leave a blot out of your tables, rather leave it upon doublets than any other, because doublets are thirty-five to one against his hitting you and any other chance is but seventeen to one against him — 5. Two of your adversary's men in your tables are better for a hit than any greater number, provided your game is forwarder, because having three or more men in your tables gives him more chances to hit you, than if he had only two men — 6. If you are to leave a blot upon entering a man on your adversary's tables and have your choice where, always choose that point which is the most dis-

# BACK GAMMON

advantageous to him. To illustrate this, suppose it is his interest to hit or take you up so soon as you enter, in that case leave the blot upon his lowest point, that is to say, upon his deuce, rather than upon his trois, and so on, because all the men your adversary plays upon his trois or his deuce points are in a great measure out of play, those men not having it in their power to make his cinque-point, and consequently his game will be crowded there and open elsewhere, whereby you will be able also much to annoy him—7 Prevent your adversary from bearing his men to the greatest advantage when you are running to save a gammon suppose you should have two men upon his ace point, and several others abroad, though you should lose one point or two in putting the men into your tables yet it is your interest to leave a man upon the adversary's ace-point, which will prevent him bearing his men to his greatest advantage, and will also give you the chance of his making a blot, that you may hit. But if, upon a calculation, you find you have a throw, or a probability of saving your gammon, never wait for a blot, because the odds are greatly against hitting it.

*Cases showing how to calculate the Odds of saving or winning the Gammon*—1 Suppose your tables made up, and that you have taken up one of your adversary's men, who has so many abroad as require three throws to put them in his table, it is then about an equal wager that you gammon him. Because, in all probability, you will bear two men before you open your tables, and when you bear the third man, you will be obliged to open your six or cinque point, in that case it is likely that your adversary must take two throws before he enters his man in your tables and two throws more before he puts that man into his own tables and three throws more to put into his own tables the men which he has abroad, in all seven throws and as you have twelve men to bear, these probably will take seven throws in bearing, because you may twice be obliged to make an ace, or a deuce, before you can bear all. No mention is here made of doublers of either side, that event being equal to each party. The foregoing case shews it is in your power to calculate very nearly the odds of saving or winning a gammon upon most occasions.

2 Suppose you have three men upon your adversary's ace point, and five points in your tables, and that the adversary has all his men in his tables, three upon each of his five highest points, what is the probability for a gammon?

	Points
For his bearing three men from his 6 point,	18
from his 5 point,	15
from his 4 point,	12
from his 3 point,	9
from his 2 point,	6
Total	60

To bring your three men from the adversary's ace-point to the six-point in your tables, being for each 18 points, make in all

54

The remainder is

6

And as, besides the six points in your favour, there is a further consideration, that your adversary may make one or two blots in bearing, you have greatly the probability of saving your gammon. This is supposed upon an equality of throwing

3 Suppose A leaves two blots, either of which cannot be hit but by two double dice to hit the one the cast must be eight, and for the other nine, by which means B has only one die to hit either of them with what are the odds of hitting either of these blots?

*Ans* The chances on two dice are in all 36

The chances to	6 and 2 twice	2
hit 8 are	5 and 3 twice	2
	2 deuces	1
	2 fours	1
The chances to	6 and 3 twice	2
hit 9 are	5 and 4 twice	2
	2 trois	1

Total chances for hitting 13

Remain chances for not hitting 25

So that it is 25 to 13 that B will not hit either blot

4 Suppose A leaves two other blot than the former, which cannot be hit but by double dice, the one by eight, and the other by seven. What are the odds of B hitting either of these blots?

*Ans* The chances on two dice are in all 36

The chances to	6 and 2 twice	2
hit 8 are	5 and 3 twice	2
	2 fours	1
	2 deuces	1
The chances to	6 and 1 twice	2
hit 7 are	5 and 2 twice	2
	4 and 3 twice	2

Total chances for hitting 14

Remain chances for not hitting 24

Therefore it is two to one that A is not hit

I take the like method with three, four, or five blots upon double dice or with blo's made upon double and single dice at the same time, then only find out (by the table of 36 chances) how many there are to hit any of those, and add all together in one sum, which subtract from the number 36, the whole of the chances upon two dice and so doing resolve any question required.

*Critical Cases for a Back game*—1 Suppose A plays the fore game, and that all his men are placed in the usual manner. For B's game suppose that 14 of his men are placed upon his adversary's ace point, and one upon his adversary's deuce point, and that B is to throw. Which game is likeliest to win the hit?—*Ans* A's is the best by 21 for, to 20 against because if B misses an ace to take his adversary's deuce point, which is 25 to 11 against him, A is in that case to take up B's men in his tables, either singly, or to make points and if B secures either A's deuce or trois point, then A is to lay as many men down as possible, in order to be hit, that thereby he may get a back game. When well versed in the game of back gammon, by practising this back game, you will become a greater proficient than by any other method, because it clearly demonstrates the whole power of the back game.

2 Suppose A to have five men placed upon his six point, five men upon his quatre point, and five men upon his deuce-point and that B has three men placed upon A's ace-point, three men upon A's trois point, and three men upon A's cinque-point, let B also have three men upon his six-point, in his own tables, and three men placed out of his tables, in the usual manner. Who has the better of the hit?—*Ans* It is an equal game, but to play it critically, the difficulty lies upon B, who should, in the first place, endeavour to gain the cinque and quatre-points in his own tables,

# BACK GAMMON.

and when that is effected, he is to play two men from A's cinque-point, in order to oblige him to blot, by throwing an ace, which, if B hits, he will have the fairest probability of winning.

3 Suppose A has three men upon B's ace-point, and three men upon B's deuce point, also three men upon his six-point in his own tables, and three men upon his usual point out of his tables, and three men where his five men are usually placed in his adversary's tables and suppose B has his men placed in the same manner, with this difference only, instead of having three men put upon A's deuce-point let B have three men upon A's trois point. Who has the best of the hit?—*Ans* A, because the ace and trois points are not so good for a hit, as the ace and deuce points in B's tables, for when you are bearing the men, you have the deuce-point in your own tables to play them upon that often prevents you from making a blot, which must happen otherwise to the adversary, and take care to lay down men to be hit as often as you can, in order to keep your game backward, and for the same reason avoid hitting any blots which your adversary makes.

4 *Cases of Curiosity and Instruction*—Suppose A has his fifteen men upon B's ace point, and that B has his bar-point, as well as his six, cinque, quatre, and trois points in his own tables. How many throws is A likely to take to bring his fifteen men into his own tables, and to bear them?—*Ans* He may undertake to do it in 75 throws. It is odds in A's favour that he throws an ace in twice, and also that he throws a six in two more throws, when these events happen, A has a probability of not wanting above two or three throws before he has got all his fifteen men into his own tables, therefore by a former rule laid down to bring your men home, and also for bearing them, you may be able to find out the probability of the number of throws required. *Note*, B stands still, and does not play.

5 Where A and B shall play fast as usual, and yet the hit may last for many hours.

Suppose B to have borne thirteen men, and that A has taken up the two remaining men. And also that A has fifteen men in B's tables, viz three men upon his six, three upon his cinque, three upon his quatre, three upon his trois, two upon his deuce, and one upon his ace-point. Let A bring his fifteen men home, by always securing six close points till B has entered his two men, and brought them upon any certain point, as soon as B has done that, A must open an ace, deuce, or trois, or all three, which effected, B hits one of them, and A, taking care to have two or three men in B's tables, is ready to hit that man, and also he being assured of taking up the other man, has it in his power to prolong the hit to almost any length, provided he takes care not to open such points as two fours, two fives, or two sixes but always to open the ace, deuce, or trois points, for B to hit.

6 What are the odds upon two dice, for throwing two aces, two fives, or two threes, in thrice?

*Ans* Supposing 36 shillings to be the stake depending, the thrower will be entitled to have for his first throw 3 0

That deducted, leaves 33, which divided again into 36 parts, make so many eleven pences, out of which the thrower is to have three for his second throw. . . . 2

The remainder, 30 shillings and three pence, is again to be divided into 36 parts, making so many ten pences, and the three pence divided into so many parts, make so many thirds of farthings, of which the thrower is to have three parts for his share for his third throw 2 6½

Total for the thrower 8 3½

So that it is 27: 8½d to 8: 3½d against the thrower, which is very nearly as 10 to 3, that two sixes, two fives, or two fours, are not in three throws.

7 *Back-game* Suppose A to have two men upon his own six point, three men upon his usual point out of his tables, two men upon the point where his five men are generally placed in his adversary's tables, five men upon his adversary's ace, and three upon his adversary's quatre-point. And B to have two men upon his own six point, likewise three upon his usual point out of his tables, two upon the point where his five are commonly placed in his adversary's tables, five upon his adversary's ace, and three men upon his adversary's trois-point. Who has the fairest chance to win the hit?—*Ans* A has, because he is to play either an ace or a deuce, from his adversary's ace point, in order to make both those points as occasion offers, and having the quatre-point in his adversary's tables, he may more easily bring those men away, and will also have a resting place by the convenience of that point, which at all times in the game will give him an opportunity of running for the hit, or staying, if he thinks proper. Whereas B cannot so readily come from the trois point in his adversary's tables.

8 Suppose A and B place their men in the following manner for a hit. A has three men upon his own six point, three upon his usual point out of his tables and nine men upon his adversary's ace, deuce, and trois points, three being upon each, and suppose B's men to be placed in the same order and manner. The result is, that the best player ought to win the hit, and the dice are to be thrown for, the situation being perfectly equal in A's and B's game. If A throw first, let him endeavour to gain his adversary's cinque point, when that is effected, let him lay as many blots as possible, to tempt B to hit him, for every time that B hits them will be in A's favour, because it puts B backward, and let A take up none of B's men for the same reason. A should always endeavour to have three men upon his adversary's ace and deuce points, because when B makes a blot, these points will remain secure, and by recourse had to a former case when A has borne five, six or more men, yet A may secure six close points out of his tables, in order to prevent B from getting his men home and by recourse had to the calculations he may easily find out (in case he makes up his tables) who has the better of the hit, and if he finds that B is the forwardest, he must then endeavour to lay such blots, as may give him a chance for taking up another man, in case B should happen to have a blot at home.

Those who play the foregoing game well may be ranked in the first class.

9 A has borne thirteen men, and has two men to bear upon his deuce-point; B has thirteen men in his own tables, with two men to enter B is to throw, and to name the throws both for 40 A

himself and A, but not to hit a blot of either side. What throw is B, to name for both parties, in order to save his gammon?—*Ans* B calls for himself two aces, which enter his two men upon A's ace-point. B also calls two aces for A, and consequently A cannot either bear a man, nor play one. Then B calls for two sixes for himself, and carries one man home upon the six point in his own tables, and the other he places upon his adversary's bar-point. B also calls six-ace for A, so that A has one man left to bear, and then B calls for himself either two sixes, two fives, or two fours any of which bear a man, in case he has men in his tables upon those points.

To suppose that both your own and your adversary's tables are made up. Also that you have one man to carry home, but that he has two men on your bar point to carry home which lie in wait to catch your man and that if you pass him you are to win the hit. Suppose also that you have it in your choice to run the risk of being hit by 7 or by 8, both of which are chances upon double dice. Which of these chances is it best for you to venture?—*Ans* That of 7, for the following reasons: 1st Because that the chances of being hit by 7 or 8 are equal. 2d If he does not hit 7, you will then have in your favour 23 chances to 13 that by your next throw you either hit or pass beyond him. 3d In case your second throw should happen to be under 7, and that consequently you cannot hit him yet you may play that cast at home, and consequently leave the blot upon double dice. Whereas, if, on the contrary, you had left the blot upon 8, you would have made a bad choice. 1st Because the chances of being hit by 7 or by 8 are only equal. 2d Because if you should escape being hit by 8, yet you would then have but 17 chances in your favour, against 19, for either hitting or passing beyond him by your next throw. 3d In case your second throw should happen to be six-ace, which is short of him, you would then be obliged to play the man that is out of your tables, not being able to play the six at home, and consequently to leave a blot to be hit by a single (or flat) die, which event, upon supposition that you play for 18 shillings a game, would entitle him to 11 shillings of the whole stake depending.

*The Laws of Back gammon*—1 If you take a man or men from any point, that man or men must be played. 2 You are not understood to have played any man, till placed upon a point, and quitted. 3 If you play with 14 men only, there is no penalty attending it, because with a lesser number you play to a disadvantage, by not having the additional man to make up your tables. 4 If you bear any number of men before you have entered a man taken up, and which consequently you was obliged to enter, such men, so borne, must be entered again in your adversary's tables, as well as the man taken up. 5 If you have mistaken your throw, and played at, and if your adversary has thrown, it is not in your or his choice to alter it, unless both parties agree.

**BACKHOUSE** *s* (from *back* and *house*) The buildings behind the chief part of the house (*Par*).

**BACKING**, in the manage, a term used for the first time of mounting a colt (or taking seat upon the saddle) after he has been previously handled, quieted, stabled, and accustomed to the mounting-bit, the cavesson, martingale, hanging-reign, saddle, and the whole of

the apparatus with which he has been led his different paces in the ring all this he should be brought to submit to most quietly, as well as to the being saddled, and every other part of stable discipline, before any attempt is made to back him; if not, it cannot be termed a completion of the system.

Opinion and practice have very much varied in respect to the age most proper for backing a colt, or even taking him in hand. Not more than half a century past, colts were never touched (upon the score of handling) till rising four, backed and brought into gentle use when rising five, and never employed in constant work till nearly or quite six years old. But from an unjustifiable precipitation, however, we now find colts handled at two, broke and racing at three, and in constant work at four in every part of the kingdom, in consequence of which, we also observe daily, horses at five, six, and seven years old, more impaired in their powers than they were formerly at double that age, and inured with strained sinews, swelled legs, splents, wind-galls, and other ailments.

**BACKING THE SAILS**, in navigation, is arranging them in a situation that will force the ship to retreat, or move backwards. This is only done in narrow channels, when a ship is carried along sideways by the tide or current, and wants to avoid any thing that may interrupt her progress, as shoals, vessels at anchor, &c. or in the line of battle, when a ship wants to be immediately opposite to another with which she is engaged.

**BACK-PAINTING**, a method of painting mezzotinto prints, pasted on glass, with oil-colours. The art consists chiefly in laying the print upon a piece of crown glass, of a corresponding size. In order to do this, the print must be well soaked in clean water, after which it must be laid between four sheets of paper, two over and two under it, that some of the moisture may be drawn out of it. In the mean while, let the glass upon which the print is to be laid be warmed at the fire, then with a brush dipped in melted Strasburg turpentine, spread the turpentine smoothly and evenly on the glass. Then lay the print upon the glass, rubbing it gently from one end to the other, that it may lie close. Lastly, with the finger, rub off the paper from the back side of the print, till nothing can be seen but the print, like a thin film left upon the glass, and set it aside to dry. When it is dry, varnish it over with some white transparent varnish, that the strokes and shades of the print may be seen through it, and it will then be fit for printing. The colours necessary to be used are merely such oil colours as painters commonly employ.

**BACKPIECE** *s* (from *back* and *piece*) The piece of armour which covers the back (*Cam*).

**BACK-RAKING** In farriery, an operation formerly used for removing indurated faeces in wind colics, by introducing the hand up the horse's rectum. It has long been in disuse, however, among judicious practitioners, and very justly; and its place supplied by injections and purgatives.

## B A C

**BACKROOM** *s* A room behind (*Moxon*)

**BACKSIDE** *s* (from *back* and *side*) 1

The hinder part of any thing (*Newton*) 2

The hind part of an animal (*Addison*) 3

The yard or ground behind the house (*Mort*)

**BACK-SINews OF A HORSE**, the extensor tendons of the foot, plac'd behind the fore leg, and very frequently injured by over-exertion The inflammation hereby produced is best removed in the first instance by emollient and astringent cataplasms If it be not removed speedily, ganglions succeed, for the general treatment and nature of which see **GANGLIONS** These, however, in horses are often removed in an early stage, by firing

**To BACKSLIDE** *v a* (from *back* and *slide*) To fall off, to apostatize (*Jeremiah*)

**BACKSLIDER** *s* (from *backslide*) An apostate (*Proverbs*)

**BACK STAFF**, an instrument formerly used for taking the sun's altitude at sea, being so called becaus the back of the observer is turned towards the sun when he makes the observation It was sometimes called *DIVIS* quadrant, from its inventor, captain John Davis, a Welchman, and a celebrated navigator who produced it about the year 1590

This instrument consists of two concentric arches of box-wood, and three vane's the arch of the longer radius is of 30 degrees, and the other 60 degrees, making between them 90 degrees, or a quadrant also the vane at the centre is called the horizon-vane, that on the arch of 60° the shade-vane, and that on the other arch the sight vane It is unnecessary to give a more minute description, since more complete and accurate instruments have entirely superseded the use of this

**BACKSTAIRS** *s* The private stairs in the house

**BACK-STAYS**, of a ship, are ropes belonging to the main-mast and fore-mast, and the masts belonging to them, serving to keep them from pitching forwards or overboard

**BACKWORD** *s* (from *back* and *word*) A word with one sharp edge (*Arbutnot*)

**BACKWARD BACKWARDS** *ad* (*lack* and *peanib*, Saxon) 1 With the back forward (*Genesis*) 2 Toward the back (*Bacon*)

3 On the back (*Dryden*) 4 From the present station to the place beyond the back (*Shakspeare*)

5 Regressively (*Newton*) 6 Toward something past (*South*) 7 Reflexively (*Dantes*)

8 From a better to a worse state (*Dryden*) 9 Past, in time past (*Locke*)

10 Perversely, from the wrong end (*Shak*)

**BACKWARD** *a* 1 Unwilling, averse (*Atterbury*) 2 Hesitating (*Shakspeare*)

3 Sluggish, dilatory (*Watts*) 4 Dull, not quick or apprehensive (*South*) 5 Late, coming after something else

**BACKWARD** *s* The things or state behind or past (*Shakspeare*)

**BACKWARDLY** *ad* (from *backward*)

1 Unwillingly, aversely (*Sidney*) 2 Perversely (*Shakspeare*)

**BACKWARDNESS**, *s* (from *backward*)

## B A C

1 Dulness, sluggishness (*Atterbury*) 2 Slowness of progression, tardiness

**BACK-WORM**, a name given by sportsmen to a disease very common to hawks, and called, also, the *fixander* The usual seat of the worms is under the skin of the lower part of the back, towards the rump This disease is often cured by a scouring of washed aloes, mustard-seed, and agaric, of each equal quantities

**BACON**, the flesh of swine, salted, dried, and generally smoked in a chimney As the history and customs relative to this savoury dish would furnish but little instruction, we shall proceed to state one of the most approved methods of preparing it

*Somersetshire* *bacon*, the most esteemed in this country, may be made any time during the last three months of the year When a hog is killed for bacon, the sides are laid in large wooden troughs, and sprinkled all over with bay salt thus they are left for twenty-four hours, to drain away the blood and the superfluous juices After this first preparation, they should be taken out, wiped very dry, and the drainings thrown away Next some fresh bay salt, well heated in a large iron frying-pan, is to be rubbed over the meat, until it has absorbed a sufficient quantity, and this friction repeated four successive days, while the meat is turned only every other day If large hogs are killed, the flitches should be kept in brine for three weeks, and during that period, turned ten times, then taken out, and thoroughly dried in the usual manner, for, unless they be thus managed, it is impossible to preserve them in a sweet state, nor will their flavour be equal to those properly cured

As the preservation of the salt used in this process, when carried on to a great extent, may be an object of economy, we shall state the following method of recovering the saline matter contained in these drainings, or in any other brine, whether from herrings, beef, or pork it was communicated by a person who had seen it practised on the continent, where culinary salt is sold at a considerable price He first added such a quantity of boiling water to the brine, or drainings, as was sufficient to dissolve all the particles of the salt This solution he then placed in either an iron or earthen vessel, over a fire, which, by boiling, forced all the feculent and animal particles to the top, so that they were carefully removed by a perforated ladle After the liquid had become clear, it was set aside for twenty four hours, in a cool place, that the colouring matter might subside But, as the combination it had formed with the boiled liquor was very tenacious, he contrived two different ways of separating it 1 A solution of alum in water, one pint to an ounce of that substance, was gradually dropt into the cold liquor, in the proportion of a table-spoonful of the former to every gallon of the latter, and the whole allowed to stand for several hours, or, 2 If time and circumstances would permit, he filtered



## BACON.

the liquor by means of long flannel slips, cut longitudinally by the web, but previously soaked in another strong and perfectly clear solution of salt these slips were so immersed into the coloured fluid that the projecting external end reached another vessel, which had been placed much lower than that containing the brine, or drainings. When these particulars were properly attended to, the absorbed liquor became almost colourless, and pellucid. Having thus procured a clear liquid solution, nothing more was required than to evaporate it to dryness, in order to reproduce the salt in its original granulated form. This process may be imitated without difficulty, and at very little expense. Dr Willich, from whose Domestic Encyclopædia we now quote, says, the second method of discharging the colour is preferable, as by this no alum will be required, which only contaminates the salt.

BACON (service of the), a custom in the manor of Whichenacre, in Staffordshire, and priory of Dunmow, in Essex, in the former of which places, by an ancient grant of the lord, a fitch of bacon, with half a quarter of wheat, was to be given to every married couple who could swear, that, having been married a year and a day, they would never within that time have once exchanged their mate for any other person on earth, however richer, fairer, or the like. But they were to bring two of their neighbours to swear with them that they believed they swore the truth. On this the lord of another neighbouring manor, of Rudlow, was to find a horse saddled, and a sack to carry the bounty in, with drums and trumpets, as far as a day's journey out of the manor. All the tenants of the manor being summoned to attend, and pay service to the bacon. The bacon of Dunmow, first erected under Henry III, was on much the same footing, only the tenor of the oath was, that the parties had never once repented, or wished themselves unmarried again.

BACON (Roger), a Franciscan friar of great genius and learning, was born near Ilchester in Somersetshire, in the year 1214. He began his studies at Oxford, though in what school or college is uncertain. In 1240, returning after a long residence at Paris, he assumed the Franciscan habit, and studied experimental philosophy with unremitting ardor and assiduity. In 1278, through the envy and malice of his illiterate fraternity, who found no difficulty in possessing the vulgar with a notion of Bacon's dealing with the devil, he was restrained from reading lectures. His writings were confined to his convent, and finally, he himself imprisoned in his cell, when 64 years old. Nevertheless, during a confinement of 10 years, he went on in the rational pursuit of knowledge, corrected his former labours, and wrote several superior pieces. He died in the year 1294, in the 80th year of his age, and was buried in the Franciscan church. His works are, 1. *Epistola fratris Rogeri Baconis de secretis operibus artis et naturæ, et de utilitate magiæ*. Paris, 1542,

4to Basil, 1593, 8vo. 2. *Opus majus*. Lond, 1733, fol published by Dr Jebb. 3. *Thesaurus chemicus*. Francf 1603, 1620. This bright luminary of the 13th century was a great linguist and grammarian, was well versed in the theory and practice of perspective, understood the use of convex and concave glasses, and the art of making them, knew the great error in the kalendar, assigned the cause, and proposed the remedy. He was also an adept in chemistry, and was really the inventor of gunpowder, possessed great knowledge in the medical art, and was an able mathematician, logician, metaphysician, and theologist. Indeed, friar Bacon is justly entitled to everlasting remembrance as a philosopher and truly great man. If knowledge, says Dr Enfield, is now too far advanced for the world to derive much information from his writings, respect must nevertheless be paid to the memory of the man who knew more than his contemporaries, and who in a dark age added new lights to the lamp of science.

BACON (Francis), baron of Verulam, viscount of St Alban's, and lord high chancellor of England under king James I. He was born in 1560, being son of sir Nicholas Bacon, lord keeper of the great seal in the reign of queen Elizabeth, by Anne daughter of sir Anthony Cook, eminent for her skill in the Latin and Greek languages. He gave even in his infancy tokens of what he would one day become, and queen Elizabeth had many times occasion to admire his wit and talents, and used to call him her young lord keeper. He was educated at Trinity college, Cambridge, a society which also enrolls among its members the illustrious names of Newton and of Barrow. While a very young student he discovered the futility of the peripatetic philosophy, which then prevailed in the schools. At the age of 16 he went to France in the suite of sir Amias Pawlet, ambassador at that court. While he was in this situation he wrote an acute piece, On the State of Europe, which displayed great observation and judgment, though he was then but 19 years of age. On the death of his father he returned to England, and entered himself of Gray's-inn, where he applied to the study of law with such assiduity, that at the age of 28 he was appointed one of the queen's counsellors. By this time he had made a great progress in the study of philosophy, and had sketched the plan of his Instauration of the Sciences, one of the greatest efforts of the human mind. Unfortunately, by his attachment to the earl of Essex, who was at enmity with Cecil, Bacon lost those advantages at court which he had a right to expect. His friend, however, feeling the value of his attachment, presented him nobly with an estate of land of considerable value. It cannot be suppressed that Bacon came forward against this friend and benefactor on his trial. In 1593 he was chosen member of parliament for Middlesex, and had the courage to oppose several measures of an arbitrary nature, for which he incurred the

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queen's displeasure. On the accession of James I his views began to brighten, and he obtained the honour of knighthood which was but the prelude to more considerable marks of distinction, in 1604 he was appointed one of the king's counsel, with a salary of 40*l* a year and a pension of 60*l* for life. The next year he published the introduction to his great work, under the title of *The Advancement and Proficiency of Learning*, which procured him from the king the post of solicitor general. About this time he bettered his fortune by marrying a daughter of Mr Barnham, a rich alderman of London. In 1611 he was appointed judge of the marshalsea court, and about the same time obtained the place of register of the star chamber, the reversion of which had been granted him twenty years before. In 1613 he was made attorney-general, and in 1616 he was sworn of the privy council. At this time he contracted a close intimacy with the favourite George Villiers, to whom he wrote an admirable letter of advice, which is extant among his works. In 1617 he was raised to the dignity of lord keeper of the great seal, and two years after he was constituted lord high chancellor of Great Britain, receiving also the patent of nobility by the title of baron of Verulam, which he exchanged the year following for that of viscount of St Alban. In 1620 he published the most elaborate of all his works, the *Novum Organum Scientiarum*, the design of which is to lay down a more perfect method of exercising the faculty of reason than had ever before been known. This work he wrote 12 times over, making it a rule to revise and correct it once a year, till he brought it to the state in which he published it in 1620. The year following he was accused in parliament of bribery and corruption in his high office, these charges, it is to be lamented, were proved and admitted by the chancellor's confession, who was fined 40,000*l* and sentenced to be confined in the Tower during the king's pleasure, and rendered incapable of ever filling any office in the state in future. He was soon restored to liberty, had his fine remitted, and was summoned to the first parliament of king Charles. It must not be omitted that the greatest part of the blame attaches to his servants, and of this he was sensible for during his trial, as he passed through the room where his domestics were sitting, they all rose up at his entrance, on which he said, "Sit down, my masters, your rise hath been my fall. After this disgrace he went into retirement, where he devoted himself to his beloved studies. Notwithstanding his pension of 1800*l* a-year and his paternal estate, which was worth 700*l* a year, his liberality was so great that at his death, in 1626, his debts amounted to 22,000*l*. His remains were interred in St Michael's church, at St Alban's, where his secretary sir Thomas Meautys erected a monument to his memory.

It must for ever be deplored that the possessor of such an extraordinary intellect as lord Bacon should have been exposed to the dangers of a

situation, to which his firmness was unequal, and, withdrawn from the retirement of his study, where he was among the first of men, should have been thrown into the tumult of business, where he discovered himself to be among the last.

"If parts allure thee, think how Bacon  
shin'd,

The wisest, brightest, meanest of mankind."  
*Pope*

The superiority, it is true, of his talents rendered him every where eminent and when we see him acting at court, in the senate, at the bar, or on the bench, we behold an engine of mighty force, sufficient, as to some it would appear, to move the world, but when we carry our research into his bosom we find little there besides the ebullition and froth of some corrupt passions, and we are struck with the contrast between the titlencess within, and the exhibition of energy without. Had Bacon contented himself with being a philosopher, without aspiring after the honours of a statesman and a courtier, he would have been a greater and a happier man.

In his literary character Bacon must always be contemplated with astonishment we cannot sufficiently admire the riches or the powers of his mind, that penetration which no depth could elude, that comprehension for which no object was too large, that vigour which no labour could exhaust, that memory which no pressure of acquisitions could subdue. We admire him as the inventor, at least in our country, of that useful as well as delightful vehicle of instruction, the *Essay* even here we see him displaying the comprehensive knowledge of Aristotle, with the graces and embellishments of Cicero. But our admiration is greatly heightened, when we consider him as the great precursor of Newton, as the father of experimental philosophy. By his two great works, *On the Advancement of Learning*, and *The New Organ of the Sciences*, written amid the distraction of business and of cares, sufficient of themselves to occupy the whole of almost any other mind, did this mighty genius first break the heavy shackles of that scholastic philosophy which had long impeded intellectual exertion, and, diverting the attention from words to things, from theory to experiment, he pointed out the road to that height of science, on which the moderns are now elevated.

His writings are, indeed, an inestimable treasure. An elegant edition of them was published in 1778, in 5 vols quarto. A translation of his *Novum Organum* was published in 1802, in 2 vols foolscap-8vo.

In consequence of the revolutions of science in the production of which Bacon was so illustrious an instrument, his philosophical works are in great measure extinct to the many, and now known scarcely otherwise than as a mighty name so that perhaps this most justly celebrated author may not improperly be considered as shrunk, like the ashes of an Alexander in a

## B A C

golden urn, within the compass of that little but sterling volume his "Essays."

**BACON**, (John) a celebrated sculptor, descended from an ancient family in Somersetshire, was born in Southwark, Nov 24, 1740, where his father, Thomas Bacon, a cloth-worker, resided. When very young, Mr Bacon discovered a great inclination for drawing, common to children, but not being particularly encouraged in it, he never made much proficiency in the art. At the age of 14 he was bound apprentice to Mr Cripe of Bow Churchyard, where he was employed in painting on porcelain. He occasionally assisted in the manufactory of china at Lambeth, particularly in forming small ornamental pieces, which he executed with so much taste as to indicate no ordinary powers. To his honour be it mentioned, that by the encouragement he met with, he was able, principally, to support his aged parents, reduced in their circumstances, though by such an exertion he was obliged to bridge himself of the necessaries of life. At the manufactory at Lambeth he had an opportunity of observing models of different sculptors, which were sent to a pottery on the same premises to be burnt. From the sight of these he immediately conceived a strong inclination for his future profession. Having once made his choice he was committing in his diligence, and it is said that his progress was as rapid as his turn was sudden and unpremeditated. During this young man's apprenticeship he formed a design of making statues in artificial stone, and to his exertions it is to be attributed the flourishing state of Coade's manufactory. In 1763, Mr Bacon attempted to work in marble, and having never seen the operation performed he was led to invent an instrument for transferring the form of the model to the marble, this is called "getting out the points," which has been brought into use both in England and on the Continent. The advantage of this instrument consists in its certainty and exactness, in its taking a correct measurement in every direction, in its occupying a small compass, and that it may be transferred either to the model or the marble, without a separate instrument for each. In 1768, Mr Bacon removed to the west end of the town and attended upon the Royal Academy, where he received his first instructions, having never before seen the art of modelling or sculpture regularly performed. In the following year the gold medal for sculpture, the first ever given by the society, was voted to Mr Bacon. He became an associate of that body in the year 1770, and from this time his reputation was firmly established, and he obtained patronage of the highest rank. It would be needless to attempt an enumeration of the various works by which he attained to the first eminence in a very difficult profession. The efforts of his genius are widely spread, and his name will long live the pride of his country, which gave him birth, and from which he had never occasion to travel for the improvement of his talents, or the cultivation of a fine taste.

## B A D

This distinguished artist was suddenly attacked with an inflammation in his bowels on the 4th of August, 1799, which terminated his life in little more than two days. He died August 7th, in the 59th year of his age, leaving behind him a character as great for integrity and virtue as he had obtained in his profession as a sculptor (*British Encyclopedia*, and *Cecil's Memoirs of Bacon*).

**BACOPA** In botany, a genus of the class pentandria, and order monogynia. Calyx five-parted, with unequal segments. corol salver-shaped, stigma capitate, capsule one celled. One species alone, a native of Guiana, stem herbaceous, fleshy, leaves opposite, lanceolate, sessile, peduncles axillary, solitary, one-flowered.

**BACTRIA**, or **BACTRIANA**, in ancient geography, a country of Asia, which comprehended the present provinces of Balk and Gaur, and probably part of Korasan.

**BACTRIANUS**, a species of the camel.

**BACIRIS** In botany, a genus of the class and order monœcia, hexandria. Male calyx three parted, corol one petalled, three cleft, stamens seated on the middle of the tube. Female calyx three-toothed, corol three-toothed, stigmas obscurely three-cleft, drupe coriaceous. Two species, both of Carthage, and each full, tall, prickly trees with frondose leaves.

**BACROPPRATA**, an ancient appellation given to philosophers by way of contempt denoting a man with a staff and a budget. The word is also written *lactropercta*. It is compounded of *βακλιν, staff*, and *ωρα, bag*, or *budget*.

**BACULARES**, a sect of anabaptists, so called, as holding it unlawful to bear a sword, or any other arms, besides a staff.

**BACULARIUS**, in writers of the middle age, an ecclesiastical apparitor, or vergor, who carries a staff, *bacculus*, in his hand, as an ensign of his office.

**BACULE**, in fortification, a kind of portcullis or gate, made like a pit-fall with a counterpoise, and supported by two great stakes.

**BACULOMETRY**, the art of measuring accessible or inaccessible heights, by the help of one or more baculi, staves, or rods.

**BAD** a (*quaad*, Dutch) 1 Ill, not good (*Pope*) 2 Vicious, corrupt (*Prior*) 3 Unfortunate, unhappy (*Dryden*) 4 Hurtful, unwholesome (*Addison*) 5 Sick.

**BAD**, or **BADE** The pretence of *bad*.

**BADAJOS**, or **BADAJOS**, a town of Spain, and capital of Estramadura, situated on the Guadiana, on the frontiers of Portugal, and see of a bishop. The fortifications are not very strong, yet it stood two sieges, one against the Portuguese in 1658, and another against the English and Dutch, supported by a considerable corps of Portuguese in 1705. eighty-two miles NNW Seville, forty-nine S Alcantara. Lon 11 58 E Ferro Lat 38 43 N.

**BADCOCK** (Samuel), an English divine, was born at South Molton, in Devonshire, Feb 23, 1747. He was educated for the clergy among the dissenters, under a Mr Rook-

er, at St Mary Ottery He was ordained pastor of a congregation at Wimbourne, in Dorsetshire, from whence he removed to Barnstaple, in Devon, in 1769 here he mingled much with men of talents, and of different sentiments, which at length produced a change in his theological opinions this change of views was not accompanied with a similar one in the minds of his congregation he therefore quitted the charge and returned to his native place, where he officiated to the dissenters till 1787, and soon after was admitted into the church of England by the bishop of Exeter After serving a church in Devonshire for a little time, he went to Bath, and became assistant to Dr Gabriel at the octagon chapel

In 1781, he distinguished himself as the reviewer and opponent of the late Mr Martin Madan's weak but popular *Thelyphthora* In this controversy Mr Badcock evinced a remarkable force of genius, skill of argument, and display of learning and justly engaged the attention and admiration of the public upon his criticisms In the same year he also wrote a poem entitled, *The Hermitage*

On the publication of Dr Priestley's *History of the Corruptions of Christianity*, Mr Badcock undertook the refutation of that part which was the most laboured and important of the whole work, viz *The History of Opinions relative to Jesus Christ* This he accordingly did in the *Monthly Review* for 1783 His critique was long, but smart, and shewed an uncommon extent of reading in the ancient fathers, ecclesiastical history, and the Socinian writings Dr Priestley felt this attack so severely, and especially as it was made from a quarter so unexpected as the *Monthly Review*, that with his usual celerity, in less than a month, he published *A Reply to the Animadversions* though the remainder of the critique upon his work had not yet appeared When he published this Reply he did not know who his antagonist was, and therefore, unbiassed by prejudice, and untouched with resentment, he bestowed this eulogium on him "The knowledge and ability of the present reviewer makes him a much more formidable, and therefore a more respectable antagonist

In the Review, for September, 1783, Mr Badcock gave a complete exhumation, and, as hath been generally thought, a complete refutation, both of the doctor's history, and the above-mentioned defence of it This critique is, indeed, a masterly performance, and searches all the doctor's arguments for his favourite cause to the very bottom

When Dr White was appointed Bampton lecturer in Easter term, 1783, in order to complete the lectures on the plan he had formed, he found it expedient to avail himself of the best aid he could procure This made him turn his attention to Mr Badcock, and about November following he paid him a visit at South Molton, for the purpose of soliciting his assistance in the formation of a work that should be worthy the attention of the public Mr Badcock undertook his part with alacrity,

executed it speedily, and in a manner, that will immortalise his name The parts allotted to, and written by Mr Badcock, are, the greatest share of Lecture the First, the best part of Lecture the Third, about a fourth of Lecture the Fifth, almost the whole of Lecture the Seventh, and a small part of Lecture the Eighth Of the notes appended to the lectures, Mr Badcock is acknowledged to have furnished about one-fourth

At the Lent assize, 1788, he preached in the cathedral of Exeter, before the judges, a sermon which was much admired by those who heard it May the 19th following he died of a bilious complaint, at the house of his affectionate and worthy friend, sir John Chichester, baronet, in Queen street, Mayfair

BADEN, or BADEN, a margravate and sovereignty of Germany, in the circle of Swabia It is divided into two principities, that of Baden-Baden, and Baden-Durlach Baden-Baden is bounded on the west by the Rhine, though a small part lies on the west side of that river, on the north by Baden-Durlach, on the east by the duchy of Wurtemberg, and on the south by the Brisgau The principal towns are Rastadt, Baden, Fittingen, Steinbach, and Stollhofen The margrave of Baden-Baden is a sovereign prince, and has a vote in the college of princes The established religion is Roman Catholic Baden-Durlach is bounded on the north by the palatinate and the bishopric of Spire, on the east by the duchy of Wurtemberg, on the south by Baden-Baden, and on the west by the Rhine The principal towns are Durlach, Pforzheim, Muhlburg, and Emmendingen This prince enjoys two votes in the college of princes of the empire, viz one for Baden-Durlach, the other for Hochberg The reigning prince and his subjects profess Lutheranism

BADEN, a town of Germany, in the circle of Swabia and capital of the marquisate of Baden-Baden, celebrated for its hot baths, whence its name Twenty two miles NE Strassburgh thirty-six W Stuttgart, and forty SSW Heidelberg Lon 25 53 E Ferro Lat 48 46 N

BADEN, a county and bailiwick of Switzerland, in Argow, formerly an independent county, but now subject to the cantons, lying on both sides the Limmat, bounded on the west by the river Aar, on the north by the Rhine, and on the south by the Reuss, about seven leagues long, and three wide The soil is fertile, and in general abounds in grain and fruit The mountains yield excellent freestone, marble, and iron ore The greater part of the inhabitants are Roman Catholics the principal town is Baden

BADEN, or UPPER BADEN, a town of Switzerland, and capital of the county so called, situated on the Limmat It is the residence of the bailiff, who is appointed by the cantons of Zurich, Berne, and Glaris, alternately; the two former appoint for seven years, but Glaris only for two Divers monuments testify the antiquity of this town, and the virtue of its

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mineral waters have been long known. The dukes of Austria had formerly a castle here, where they resided when they visited their estates in Helvetia, till it was taken, with the whole country, from duke Frederick, in the year 1415. The baths are constructed on both sides of the Limmat, and form a separate town half a mile below the other. The waters are warm and abundant, supplying two large public reservoirs for the use of the poor, besides two hundred private baths. twenty-seven miles S E Bâle, fourteen NW Zurich Lon 25 53 E. Ferro Lat 47 28 N

**BADGE** *s.* (*bayulo*, to carry, Lat) 1 A mark or cognizance worn (*Atterbury*) 2 A token by which one is known (*Faifax*) 3 The mark of any thing (*Dryden*)

To **BADGE** *v a* To mark (*Shakspeare*)

**BADGER** *s* (*bayulo*, to carry, Lat) One that buys corn and victuals in one place, and carries it to another (*Cowell*)

**BADGER**, in zoology See **URSUS**

**BADGER-BAITING** **BADGER-HUNTING** The badger has suffered more perhaps from vulgar prejudices than any other animal. He has been accused of destroying lambs and rabbits the first unquestionably without foundation, and it is uncertain whether the last charge be better supported, for many naturalists maintain that his sole food consists in roots, fruits, grass, insects, and frogs. From this general and double accusation, however, the harmless badger has been selected to make sport, as it is called, for the vulgar, in both hunting and baiting.

*Hunting the badger* is in general only performed by moonlight, the badger, from his natural habits, being never to be found above ground by day. In this sport the hunters are obliged to oppose art to cunning, and obtain by stratagem what they cannot effect by strength. At a late hour in the evening, when the badger is naturally concluded to have left his kennel or his castle in search of food, some of the party (as previously adjusted) proceed to place a sack at length within the burrow, so constructed that the mouth of the sack directly corresponds with the mouth of the earth, and is secured in that position by means of a willow hoop, which, from its pliability, readily submits to the form required. This part of the business being completed, the parties withdrawn, and the signal whistle given, their distant companions lay on the dogs, (either hounds, terriers, lurchers, or spaniels), encouraging them through the neighbouring woods, coppices, and hedge-rows, which the badgers abroad no sooner find, than being alarmed, and well knowing their inability to continue a state of warfare so much out of their own element, instantly make to the earth for shelter, where, for want of an alternative, and oppressed with fear, they rush into certain destruction by entering the sack, being entangled in which, soon secured by those who are fixed at that purpose. If the badger find the ill-construction or accidental fall of the sack, and safely enter the earth,

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digging him out is not only a very laborious but very precarious attempt, for the badger, from instinctive ingenuity, will be generally found to have formed his retreat before he can be reached, to render which the more easy, he usually constructs his kennel among the roots of some old pollard, in the banks of moors, or underneath some hollow tree from the spreading root branches of which the burrows run in such various and perplexing directions, that his assailants are often compelled, after tiring themselves by digging fifteen or twenty feet, to relinquish the pursuit, corroborating the opinion of the common people, that in a loose and sandy soil badgers can make a way as fast as their hunters can pursue them whence drawn battles in such situations are very common results.

*Badger-baiting* is a different sport, and if possible of a still lower description. It consists in attacking the animal at a distance from his burrow, with dogs of almost any kind, but most successfully with the terrier. The badger is so rapid in his motions, that the dogs are often desperately wounded, and compelled to give up the contest. The looseness and thickness of the badger's skin are admirably contrived for his advantage, in consequence of the latter, and especially in conjunction with the coarseness and toughness of his hair, it is difficult for the dogs to lay hold of him, and in consequence of the former, he finds great facility of escaping from their grasp when they have succeeded.

**BADIAN SEMEN** See **ANISUM STELLATUM**

**BADIGEON**, a mixture of plaster and free-stone, well ground together, and sifted, used by statuary to fill up the little holes, and repair the defects in stones, whereof they make their statues and other work.

The same term is also used by joiners for saw-dust mixed with strong glue, wherewith they fill up the chaps, and other defects in wood, after it is wrought.

**BADLY** *ad* (from *bad*) Not well (*Shak*)

**BADNESS** *s* Want of good qualities (*Addison*)

**BÆA**, in botany, a genus of the class dianthia, order monogynia. Corol ringent, with a very short tube, the upper lip three-toothed, lower flat, two lobed, capsule two-celled, four-valved, twisted, calyx five-parted, equal. One species only, a native of the straits of Magellan, a stemless plant, with blue flowers.

**BÆCKFA**, in botany, a genus of the class octandria, genus monogynia. Calyx funnel-form, five-cleft, corol five-petalled, capsule three or four-celled, many-seeded, covered with the calyx. Two species only.

1 *B. futescens* a Chinese shrub

2 *B. dentifolia* a native of New Holland

**BÆOBOTRYS**, in botany, a genus of the class pentandria, order monogynia. Corol tubular, five cleft, calyx double superior; the outer two-leaved, inner campanulate, five-toothed, berry one-celled, many-seeded. Two species.

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1 *B nemoralis* a native of the Tanna island

2 *B lanceolata* Arabia *Ælæx*

**BÆTICA**, a province of ancient Spain, so called from the famed river *Bætis*, afterwards *Fartessus*, now *Guadalquivir*, or the great river. It was bounded on the west by *Lusitania*, on the south, by the Mediterranean and *Sinus Gaditanus*, on the north, by the *Cantabric* sea, now the Bay of Biscay. On the east and north east its limits cannot be so well ascertained, as they are very reasonably thought to have been in a continual state of fluctuation, as each petty monarch had an opportunity of encroaching upon his neighbour. The province was divided in two by the river *Bætis* already mentioned. The whole province of *Bætica* contained, according to the most probable account, what is now called *Andalusia*, part of the kingdom of *Grenada*, and the outward boundaries of *Estramadura*.

**BÆTYLIA**, anointed stones worshipped by the Phœnicians, by the Greeks before the time of Cæsar, and by other barbarous nations. They were commonly of a blue colour, and consecrated to some god, as *Saturn*, *Jupiter*, the *Sun*, &c. Some are of opinion that the true origin of these idols is to be derived from the pillar of stone which *Jacob* erected at *Bethel*, and which was afterwards worshipped by the Jews. These *Bætylia* were much the object of the veneration of the ancient heathens. Many of their idols were no other

**BAFFETIAS**, or **BASTAS**, a cloth made of coarse white cotton thread, which comes from the East Indies. Those of *Surat* are the best.

**BAFFIN'S BAY**, the name given to a gulph in North America, running from 70 to 79 N lat pretended to be discovered by one *Baffin*, in 1616. This bay has obtained a place on most, if not all, modern maps and globes, though there is great reason to doubt whether it has any real existence.

*To BAFFLE v a* (*beffler*, French) 1 To Judo, to make ineffectual (*South*) 2 To confound, to defeat with some confusion (*Addison*)

**BAFFLE s** (from the verb) A defeat (*So*)

**BAFFLER s** (from *baffle*) He that puts to confusion, or defeats (*Gov of the Tongue*)

**BAFFO**, a considerable town in the island of *Cyprus*. Lat 34 50 N Lon 32 30 E. Near this was the ancient *Paphos*.

**BAG s** (*belge*, Saxon) 1 A sack, or pouch (*South*) 2 That part of animals, in which some particular juices are contained (*Dryden*) 3 An ornamental purse of silk tied to men's hair (*Addison*)

**BAG**, in commerce, a term signifying a certain quantity of some particular commodity. A bag of almonds, for instance, is about 300 lb weight, of aniseeds, from 300 to 400, of hops, about 2½ cwt &c. Bags are also used in most countries to put several sorts of coin in, either of gold, silver, brass, or copper.

**BAG**, in botany. See **FOLLICLE**

**BAG**, among farmers, a name given to a

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medicine formerly much esteemed for restoring a lost appetite. It consists of an ounce of *assafœtida*, and an equal quantity of powdered *savine*, put into a small bag, which they fasten to the horse's bit, and keep him bridled for the space of two or three hours, twice or three times a day.

*To BAG v a* (from the noun) 1 To put into a bag (*Dryden*) 2 To load with a bag (*Dryden*)

*To BAG v n* To swell like a full bag (*Dryden*)

**BAGATELLE s** (*bagatelle*, Fr) A trifle not English (*Prior*)

**BAGAUDÆ**, or **BACAUDÆ**, an ancient faction of peasants, or malecontents, who ravaged Gaul. The Gauls being oppressed with taxes, rose about the year of Christ 290, under the command of *Amand* and *Ellan*, and assumed the name *bagaudæ*, which, according to some authors, signified in the Gallic language forced rebels, according to others, *tribute*, according to others, *robbers*.

**BAGDAD**, a town of *Asia*, in the Arabian *Irit*, on the east side of the *Tigris*. It is computed to be about one thousand five hundred paces in length, seven or eight hundred in breadth, and three thousand in circumference. Its walls are of brick, with terraces, and large towers at proper distances, in form of bastions, and defended by about sixty pieces of cannon. The castle is large, and flanked by some small towers with cannon, and the garrison usually consists of nine hundred foot, four thousand horse, and sixty gunners. The inhabitants are thought to be about fifteen thousand, including those who live in a suburb, on the other side of the *Tigris*, at the end of the bridge of boats, which is undone every night to prevent a surprise. Bagdad was built out of the ruins of the Old *Seleucia*, by *Mohammed II* caliph of the *Saracens*, who, in 762, made it the capital of his kingdom. Lat 33 20 N Lon 44 26 E.

**BAGGAGE**, in military affairs, denotes the clothes, tents, utensils of divers sorts, provisions, and other necessaries, belonging to an army. Before a march, the waggons with the baggage are marshalled according to the rank which the several regiments bear in the army, being sometimes ordered to follow the respective columns of the army, sometimes to follow the artillery, and sometimes to form a column by themselves. The general's baggage marches first, and each waggon has a flag, showing the regiment to which it belongs.

*Packing up the baggage* (*vasa colligere*), was a term among the Romans, for preparing to go to war, or to be ready for an expedition. They distinguished two sorts of baggage, a greater and less. The less was carried by the soldier on his back, and called *sarcina*, consisting of the things most necessary to life, and which he could not do without. Hence *colligere sarcinas*, packing up the baggage, is used for decamping, *castra movere*. The greater and heavier was carried on horses and vehicles, and called *onera*. Hence *onera vehiculorum*, *sar-*

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*and hominum* The baggage-horses were designated *sagmenarii equi*

**BAGGAGE**, a worthless woman

**BAGGING OF HOPS** See **HOPS**

**BAGNAGAR**, the capital of the kingdom of Golconda, a province belonging to the Great Mogul Here are abundance of European jewellers, as also Jews, Armenians, and Grecks, the most expert cutters of diamonds, and best judges of their worth Lat 15 30 N Lon 78 30 E

**BAGNERES**, a town of France, in the department of the Upper Pyrenées, and late province of Bigorre Lat 43 3 N Lon 0 12 E

**BAGNIO**, an Italian word, signifying a bath we use it for a house with conveniences for bathing, cupping, sweating, and otherwise cleansing the body, and too frequently for worse purposes

**BAGNOLIANS**, or **BAGNOLANSES**, in church-history, a sect of heretics, who in reality were Manichees, though they somewhat disguised their errors They rejected the Old Testament and part of the New, held the world to be eternal, and affirmed that God did not create the soul when he infused it into the body

**BAGPIPE**, a musical instrument of the wind-kind, chiefly used in country places, especially in the north It consists of two principal parts, the first a leathern bag which is blown up like a football, by means of a port-vent, or little tube, fitted to it and stopped by a valve The other part consists of three pipes, or flutes, the first called the great pipe, or drone, and the second the little one, which pass the wind only out at the bottom the third has a reed, and is played on by compressing the bag under the arm, when full, and opening or stopping the hole, which are eight, with the fingers The little pipe is ordinarily a foot long, that played on thirteen inches, and the port-vent six The bagpipe takes in the compass of three octaves

**BAGPIPE**, in architecture, a small round moulding, less than an astragal

**BAGUETTE DEVINATOIRE**, the divining rod, a piece of philosophical quackery The divining rod is nothing else than a forked piece of hazel, the two branches of which are often from fifteen to eighteen inches in length, and form an angle of thirty or forty degrees The two branches are held in the hands in a certain manner, so that the trunk or middle is turned towards the heavens Some persons, it is said, are endowed with such a property, that if they hold this rod as above described, it tends by a violent effort to turn its trunk downwards, when in the proximity of a spring, or of precious metals concealed in the bowels of the earth, or stolen money, &c Nay, some have even asserted, that it has pointed out, in this manner, the traces of criminals, robbers, or assassins. (See Hutton's Translation of Montfaucon's Ornam, vol iv p 260) A lady of noble birth whose name we are not at liberty to mention in public wrote several letters to Dr

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Hutton on the subject of the divining rod, describing the way in which she discovered that she possessed the faculty of finding water by such an instrument, and relating that she actually found water by means of the hazel, in the duke of Manchester's park, at Kimbolton, Huntingdonshire, about thirty years ago The same lady also exhibited successfully her method of discovering water, about two years ago at Woolwich Common Still we must be permitted to think the whole a delusion, and we believe, that in the case now adverted to the lady, though of an acute and accomplished mind, has in some way or other deluded herself

**BAHAMIA ISLANDS** called also the **ILLAYA ISLANDS** the easternmost of the Caribbees in the Atlantic Ocean They are very numerous

**BAHAR**, a country of Hindoostan Proper, bounded on the W by Allahabad and Oude, on the N by Nepal, on the E by Bengal, and on the S by Orissa It is subject to the English East India Company, and most of the saltpetre they export is manufactured in this province of which Patna is the capital

**BAHAR**, or **BARR** a weight used in Persia, Mocha, in the Moluccas, Achem, and divers other parts of the East-Indies The great bahar is 181 pounds 4 ounces, and the little 101 pounds 7 ounces, Paris measure

**BAHARI N ISLAND**, an island in the Gulph of Persia, formerly famous for its pearl fishery, which is now almost ruined Lat 20 10 N Lon 49 5 E

**BAHUS**, a fortified town of Sweden Lat 57 52 N Lon 11 42 E

**BAIÆ**, now **BAJAH**, a city of Campania, near the sea, founded by Barus, one of the companions of Ulysses It is famous for its delightful situation and baths, where many of the Roman senators had country houses (*Martial, Horat &c*)

**BAIAH**, a town of Naples, in Italy, famous for its hot baths and elegant palaces in the time of the Romans of which some ruins still remain Lat 40 51 N Lon 14 5 E

**BAIDARS**, the name of a kind of small canoes, used among the natives of the Kurilly islands, and of the north western coast of America

**BAIKAL**, a lake of Siberia, on the road from Muscovy to China It is of large extent, and its waters are fresh and clear There are a great many seals in it of a blackish colour, with multitudes of fish, particularly sturgeons of a prodigious size Lat 51 20 to 55 20 N Lon 104 to 110 E

**BAIL**, in law, the setting at liberty one arrested, or imprisoned upon an action either civil or criminal, under sureties taken for his appearance at a day and place assigned It is called *bail*, because hereby the party confined is *baillè*, from the Greek βαλλω, delivered into the hands of those who bind themselves for his forthcoming, or from *bail*, used in the sense of a guardian, into whose hands the party is put for security sake Manwood distinguishes between *bail* and *mainprise* thus he that is



mainprised is said to be at large, and to go about at his liberty, without ward, till the time of appearance, whereas he who is let to bail to two or more men, is always accounted by law to be in their ward and custody for the time, and they may, if they please, actually keep him in prison. In civil cases every defendant is *littable*, but in criminal matters it is otherwise. By the ancient common law, before and since the Conquest, all felonies were *bailable*, till murder was excepted by statute. But the stat Westm 1 3 Edw I

15 takes away the power of *bailing* in treason, and divers instances of felony. And the statute 1 and 2 Ph and Mar c 13 farther regulates this matter so that now no justices of the peace can bail upon an accusation of reason, of murder, or of manslaughter, if the prisoner be clearly the slayer, or an indictment be found against him, nor of felony, against those who have broken prison. Outlawed persons, and those who have abjured the realm, approvers, and persons accused by them persons taken with the *mainour*, or in the fact of felony, persons charged with *arson*, and excommunicated persons, are also inadmissible to bail. But it is agreed that the court of King's Bench (or any judge thereof, in time of vacation) may bail for any crime whatever. And herein the wisdom of the law is manifest. To allow bail to be taken commonly for enormous crimes would greatly tend to elude the public justice, and yet there are cases, though they seldom happen in which it would be hard and unjust to confine a man in prison, though accused even of the greatest offence. The law has therefore provided one court, and only one, which has a discretionary power of bailing in any case except only even to this high jurisdiction, and of course to all inferior ones, such persons as are committed by either house of parliament, so long as the session lasts, or such as are committed for contempts by any of the inferior superior courts of justice.

**CLERK OF THE BAILS**, is an officer belonging to the court of the King's bench. He files the bail-pieces taken in that court, and tends for that purpose.

**BAIL, or BALE**, in the sea-language. The common call throwing the water by hand out of the ship or boat's hold, *bailing*. They also all those hoops that bear up the tilt of a boat, its *bails*.

To **BAIL** *v a* (from the noun) 1 To give bail for another (*Shakspeare*) 2 To admit to bail (*Lawson*)

**BAILABLE** *a* (from *bail*) That may be set at liberty by bail or surties.

**BAILIFF**, in Scots law, a judge anciently appointed by the king over such lands not rected into a regality as happened to fall to the crown by forfeiture or otherwise, now abolished. It is also the name of a magistrate in a royal borough, and of the judge appointed by a baron over lands erected into a barony.

**BAILIFF**, (*littatus*, from the French word *baillif*), that is, *praefectus provinciae*, and as the name, so the office itself was answer-

able to that formerly in France, which had eight parliaments, that were high courts from whence there lay no appeal, and within the precincts of the several parts of that kingdom which belonged to each parliament, there were several provinces in which justice was administered by certain officers called *littiffs*, and in England there are several counties in which justice hath been administered to the inhabitants by the officer who is now called *sheriff* or *viscount* (one of which names descends from the Saxons, the other from the Normans), and though the sheriff is not called *bailliff*, yet it is probable that was one of his names also, because the county is often called *littiva*. And in the statute of Magna Charta, c 28 and 14 Ed III c 9 the word *bailliff* seems to comprise as well sheriffs as bailiffs of hundreds. As the realm is divided into counties, so every county is divided into hundreds, within which in ancient times the people had justice ministered to them by the officers of every hundred. But now the hundred courts, except certain franchises, are swallowed in the county courts, and the bailiff's name and office are grown into contempt, they being generally officers to serve writs, &c within their liberties. Though, in other respects, the name is still in good esteem for the chief magistrates in divers towns are called *bailliffs* or *baillies*, and sometimes the persons to whom the king's castles are committed are termed *bailliffs*, as the *bailliff of Dover Castle*, &c.

**BAILIFF** also signifies an under steward of a manor.

**WATER-BAILIFF**, an officer appointed in all port towns for the searching of ships, gathering the toll for anchorage, &c and arresting persons for debt, &c on the water.

**BAILIWICK**, that liberty which is exempted from the sheriff of the county, over which liberty the lord thereof appoints his own bailiff, with the like power within his precinct as an under-sheriff exercises under the sheriff of the county or, it signifies the precinct of a bailiff, or the place within which his jurisdiction is terminated.

**BAILLY** (John Sylvain), a celebrated French philosopher, was born at Paris in September, 1736. He early showed a strong inclination to scientific pursuits, which was encouraged by his friends. When young, he communicated some valuable papers to the Royal Academy of Sciences, and, in 1773, addressed a letter to Bernoulli, on some discoveries respecting the satellites of Jupiter, which was inserted in the Journal Encyclopedique. In 1768 he published the eloge of Leibnitz, for which he was rewarded with the gold medal by the academy of Berlin. This was followed by the eloges of Charles V., La Caille, and Corneille, which, with the former, were collected together. In 1775 appeared the first volume of his great and excellent work, 'The History of Astronomy, the third and last volume of which was published in 1779. Besides these performances, this great man presented the learned world with a great number of va-

lucable historical disquisitions and astronomical observations. He was elected into the French academy in 1763. How is it to be lamented that such a mind as that of Bailly should be hurried into the gulph of revolutionary politics! He entered eagerly into the concerns of his native country, and was president of the first national assembly, at the time when the king issued a proclamation for them to disperse. On the ever memorable 14th of July, 1789, he was chosen mayor of Paris, but he held his popularity a very little while, owing to the liberal sentiments which he expressed for the royal family, and his enforcing obedience to the standing laws. In consequence of this he resigned his office in 1791, and went into that philosophical retirement, from whence it would have been prudent for him not to have issued at first. When the reign of terror and blood naturally came on, Bailly was selected as one of its victims, and suffered under the detestable guillotine, Nov 12th, 1793, aged 57 years. For an account of his different works and papers in the *Mem Acad*, see the *Eloge de Bailly*, by Lalande, or Hutton's *Dict art*. **BAILLY**. See also Bailly's posthumous work, entitled *Memoires d'un Témoin de la Revolution*, or Edinburgh Review, vol vi p 137, &c.

**BAILMENT**, in law, is a delivery of goods in trust, upon a contract, expressed or implied, that the trust shall be faithfully executed on the part of the bailee. As if cloth be delivered, or (in our legal dialect) bailed, to a taylor to make a suit of clothes, he has it upon an implied contract to render it again when made, and that in a workmanly manner. If money or goods be delivered to a common carrier to convey from Oxford to London, or from London to Edinburgh, &c. he is under a contract in law to pay, or carry them to the person appointed. If a horse or other goods be delivered to an innkeeper or his servants, he is bound to keep them safely, and restore them when his guest leaves the house. If a man takes in a horse, or other cattle, to graze and depasture in his grounds, which the law calls *agistment*, he takes them upon an implied contract to return them on demand to the owner.

**BAINBRIDGE** (Dr John), an eminent physician and astronomer, born at Ashby-de-la-Zouch, in Leicestershire, in 1582. He taught a grammar-school for some years, and practised physic, employing his leisure hours in astronomy, which was his favourite study. At length he removed to London, was admitted a fellow of the College of Physicians, and raised his character by his description of the comet in 1618. The next year sir Henry Savile appointed him his first professor of astronomy at Oxford, and the masters and fellows of Merton college made him first junior, and then superior, reader of Linacre's lecture. He died in 1643, having written many works, some of which have never been published, but the MSS are preserved in the library of Trinity College, Dublin.

**BAINA**, or **BAIN RIVER**, a large

river of Hindoostan, which rises near the S bank of the Nerbudda, runs southward through the heart of Berar, and, after a course of near four hundred miles, unites with the Godaverry, within the hills that bound the British Northern Circars.

**BAIRAM**, or **BEIRAM**, a Turkish word which signifies a solemn feast. The Mahometans have two bairams, the *great* and the *little*. The *little* bairam is properly that held at the close of the fast *Ramazan*, beginning with the first full moon in the following month, Shawal. The *great* bairam is properly that held by the pilgrims at Mecca, commencing on the 10th of Dhu Ihajja, (when the victims are slain), and continuing three days. On the feast of bairam, after throwing little stones, one after another, into the valley of Mina, they usually kill one or more sheep, some a goat, bullock, or even a camel, and after giving a part thereof to the poor, eat the rest with their friends. After this, they shave themselves. The second is a day of rest, and on the third they set out on their return home.

**To BAIT** *v a* (baian, Saxon) 1 To put meat to tempt animals (*Ray*) 2 To give meat to one's self, or horses, on the road (*Spenser*)

**To BAIT** *v a* (from *baître*, Fr) 1 To attack with violence (*Shaks*) 2 To harass by the help of others

**To BAIT** *v n* To stop at any place for refreshment (*Milton*)

**To BAIT** *v n* (as a hawk) To clap the wings, to flutter (*Shaks*)

**BAIT** *s* (from the verb) (See **ANGLING**) 1 Meat set to allure animals to a snare (*Sh*), 2 A temptation, an enticement (*Addison*), 3 A refreshment on a journey.

**BAIT-EL LAHAM**, the ancient *Bethlehem*, in geography, a village about two leagues SE. of Jerusalem.

**BAITING**, the act of smaller or weaker beasts attacking and harassing greater and stronger. In this sense we hear of the baiting of bulls or bears by mastiffs or bull-dogs with short noses, that they may take the better hold. The plea of utility is made in justification of *bull-baiting*, as a bull is rarely killed without being first baited. But the flesh, though tenderer and more digestible, is in reality more disposed to putrefaction, and perhaps on this account is scarcely so wholesome. But it is in fact a spirit of barbarism that keeps up the sport. Bulls are kept on purpose, and exhibited as standing spectacles for the public entertainment. The poor beasts have not fair play; they are not only tied down to a stake, with a collar about their necks, and a short rope, which allows them only about four or five yards play, but they are disarmed too, and the tips of their horns cut off, or covered with leather, to prevent their hurting the dogs. In this sport, the chief aim of the dog is to catch the bull by the nose, and hold him down to which end he will even creep on his belly. The bull's aim, on the contrary, is with equal industry to defend his nose in order to which, he thrusts it close to the ground, where him

## BAK

horns are also in readiness to toss the dog Bull baiting was first introduced into England as an amusement in the reign of king John, about the year 1209

**BAJULUS**, an ancient officer in the court of the Greek emperors There were several degrees of *hajuli* as, the grand *bajulus*, who was preceptor to the emperor, and the simple *layuli*, who were sub-preceptors The word is derived from the Latin verb *bajulare*, "to carry or bear a thing on the arms or on the shoulders"

**AJULUS**, in entomology, a species of cerambyx, found in the trunks of trees in the northern parts of Europe See **CERAMBYX**

**BAIZE**. *s* A kind of coarse open cloth

**To BAKE** *v a* (*bacan*, Saxon) 1 To heat any thing in a close place (*Israh*) 2 To harden in the fire (*Bacon*) 3 To harden with heat (*Dryden*)

**To BAKE** *i n* 1 To do the work of baking (*Shaks*) 2 To be heated or baked (*Shaks*)

**BAKEHOUSE** *s* A place for baking bread

**BAKFR** *s* (from *to bake*) He whose trade is to bake (*South*)

**BAKER** (Thomas), a learned mathematician, was born at Ilton, in Somersetshire, in 1625 In 1645, he was chosen scholar of Wadham college, Oxford, and, in 1647, he took the degree of B A On leaving the university, he obtained the living of Bishop's-Nymmet, in Devonshire, where he devoted himself to his studies, particularly to the mathematics He published the Geometrical Key, or the Gate of Equations unlocked, &c 1684, 4to Not long before his death, the Royal Society sent him some questions, which he solved in so satisfactory a manner, that they presented him with a medal, with a flattering inscription upon it He died at his vicarage in 1690

**BAKER** (Henry), an eminent naturalist, was born in London, and brought up to the business of a bookseller, which profession he quitted, and undertook to teach deaf and dumb persons to speak, by which he acquired a handsome fortune He married a daughter of Daniel de Foe, by whom he had two sons In 1740, he was chosen fellow of the Antiquarian and Royal Societies, and from the latter he received, the same year, sir Godfrey Copley's gold medal for his microscopical experiments on saline particles He died in 1774, above seventy years old He published the Microscope made easy, 8vo 1742, and Employment for the Microscope, 8vo 1764 He also wrote Original Poems, serious and humorous, published in 8vo 1725 But the best of his poetical performances, is The Universe, a poem, intended to restrain the pride of man, 8vo Mr Baker communicated a great number of curious papers to the Royal Society, which were inserted in the Philosophical Transactions (*Watkins*).

**BAKEWELL**, a pretty large town in Derbyshire, with a market on Mondays Lat. 53 16 N. Lon. 2. 43 W

## BAK

**BAKEWELL** (Robert), a celebrated farmer and breeder of cattle, was born in 1726, at his paternal estate of Dishley, in Leicestershire. He conducted the farm for several years before his father's death, and particularly turned his attention to improve the breed of his cattle, for which purpose he travelled all over England, and into Ireland and Holland. In a little time he had the satisfaction to see his endeavours crowned with success, and the Dishley sheep to be distinguished above all others About 1760, he sold his sheep at not more than two or three guineas each Some time afterwards he let out his rams, and for a few seasons received only fifteen shillings and a guinea each At length he advanced his prices, and, in 1770, some of his rams were let for twenty-five guineas Since then the prices and credit of his stock increased amazingly, so that single rams have been let for four hundred guineas! It is a fact, that one ram, called the *two pounder*, produced in one season the sum of eight hundred guineas, independent of ewes of Mr. Bakewell's own stock, which at the same rate would have made a total, the produce of a single ram, of 1200 guineas! The race of Dishley sheep are known by the fineness of their bone and flesh, the lightness of the offal, the disposition to quickness, and, consequently, to mature and fatten with less food than other sheep of equal weight He also greatly improved his black cattle, and frequently let his bulls at fifty guineas a season each! Mr. Bakewell died in 1795 He was a pleasant, hospitable, and intelligent man, and particularly humane to his beasts (*Watkins*)

**BAKING**, the art of preparing bread, or reducing meals of any kind, whether simple or compound, into bread (See the article **BREAD**) The various forms of baking among us may be reduced into two, the one for unleavened, the other for leavened bread For the first, the chief is manchet-baking, the process whereof is as follows: The meal, ground and bolted, is put into a trough, and to every bushel are poured in about three pints of warm ale, with barm and salt to season it This is kneaded well together with the hands through the brake, or, for want thereof, with the feet, through a cloth after which, having lain an hour to swell, it is moulded into manchets, which, scored in the middle, and pricked at the top, to give room to rise, are baked in the oven by a gentle fire For the second, sometimes called *cheat-bread baking*, it is thus: Some leaven (saved from a former batch) filled with salt, laid up to sour, and at length dissolved in water, is strained through a cloth into a hole made in the middle of the heap of meal in the trough, then it is worked with some of the flour into a moderate consistence this is covered up with meal, where it lies all night, and in the morning the whole heap is stirred up, and mixed with a little warm water, barm, and salt, by which it is seasoned, softened, and brought to an even leaven it is then kneaded, moulded, and baked, as before

A proper degree of heat is an essential requi-

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ate to the baking process. When the inner arch of the oven appears entirely white, it is generally considered as sufficiently heated. But this being a fallacious criterion, we would recommend the following. Place a handful of flour before the aperture of the oven, and if it turn of a brown colour, the heat is then nearly of the degree required, but if it become black, or remain white, in the former case the fire must be considerably reduced, and in the latter more fuel must be added. Lastly, all parts of the oven should be uniformly heated, and though we cannot enter into farther particulars, yet the attentive housewife will easily, from her own observations, regulate the degree of heat, with the same effect as it might be done by Mr Wedgwood's pyrometer for the baking of earthen-ware.

Musty flour, when baked into bread, is not only extremely detrimental to health, but it also imparts a bitter and nauseous taste. When such flour is not too strongly tainted, it may be corrected by first kneading it with leaven or sweet barm, then making large holes with a wooden cylinder in the dough, filling up the cavities with flour that is perfectly sweet, suffering it to remain in this preparatory state till the next morning, then removing the dry flour carefully with long spoons or similar implements, and afterwards converting the dough into bread, with the addition of such flour as is not musty. By this simple process, the flour first mixed up will be sweetened, but that which has been left over night in the dough is said to become so corrupted that it can be given only to animals.

It has frequently been attempted, and not without success, to bake good, wholesome bread, with little or no barm. In consequence of a dispute between the brewers and bakers of Dublin, concerning the price of yeast, in the year 1770, the latter carried the point, by making their bread without it. As this process, however, could not be readily imitated in domestic life, we shall here state a method of raising a bushel of flour with a tea-spoonful of yeast, first practised by James Stone. It is as follows. Put a bushel of flour into the kneading-trough or trendle, take about three-quarters of a pint of warm water, and thoroughly mix with it a spoonful of thick, sweet barm; then make a hole in the middle of the flour, large enough to contain two gallons of water, pour in your small quantity, and stir it with a stick, so that it may, with some of the flour combining with it, acquire the consistence of batter for pudding, then strew a little dry flour over it, and let it stand for about one hour, when you will find the small portion so mixed, that it will break through the dry flour scattered over it. After this, pour in another quart of warm water, while you are stirring in more flour, till it become as thick as before, then again shake dry flour over it, and leave it for two hours longer—repeat the same method about twice more, always suffering it somewhat longer to be at rest, and the bread will become as light as if a pint of barm had been

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used. Nor does this method require above a quarter of an hour more time than the usual way of baking, and the author of it asserts that his bread has never been heavy nor bitter.

With respect to the difference of seasons, J Stone directs that, in summer, the water should be used blood warm; in winter, or cold frosty weather, as hot as the hand can bear it without pain, while in the former season the dough should be covered up very warm, and strewed over with dry flour every time tepid water is added, to keep in the heat. After using six or eight quarts of such water to every bushel of flour, in the gradual manner before described, it will be found that the whole body of flour which is mixed with the warm water, by means of a single tea-spoonful of barm, is brought into considerable agitation, so that it works or ferments without difficulty. See also YEAST.

BALA, a town of Merionethshire, in North Wales, with a market on Saturdays. Lat 52 50 N Lon 3 35 W.

BALAAM, in scripture biography, the son of Bosor, a prophet or diviner of the city of Pethon, on the Euphrates. See Numbers, xii, xiii, xxiv Deut xxiii.

BALÆNA, whale, in zoology, a genus of the class mammalia, order cetæ. Toothless, and instead of teeth horny lamina in the upper jaw, spiracle, with a double opening on the top of the head. See Nat Hist pl XXIX.

1 B mysticetus Common whale, or great mysticete

- 2 B physalus Fin fish
- 3 B hoops Pike headed whale
- 4 B gibbosa Hump whale
- 5 B musculus Broad-nosed whale
- 6 B rostrata Beaked whale

Of b mysticetus, or common whale, there are three varieties

- a nostrils flexuous, on the fore part of the head, with a dorsal fin
- ♂ body black with a whitish gloss
- γ larger and without spiracle

This species inhabits the seas towards the arctic pole, is timid, and swims with great velocity, feeds chiefly on crabs, and medusæ, is sought after for the sake of its blubber, and the horny lamina in the upper jaw, usually called whale bone. Teats two, proportionally small, gravid from nine to ten months, produces one young, rarely two measures from fifty to a hundred feet in length. Head about a third part of the body, flatish above, with a tubercle, in which is found a spiracle or opening, mouth long, curved like the italic letter *c*, lower jaw very broad in the middle. Tongue soft, white, adhering to the lower jaw, spotted with black at the sides, eyes size of an oval, lateral, remote, above the ears, skin an inch thick, tail slightly bifid, from the centre of which a sharpish angular ridge runs up the middle of the back.

The remainder of the history of the mysticete, or common Greenland whale, we shall present to the reader in the language of Fre-

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deric Martens, in his voyage to Spitzbergen, as corrected by Dr Shaw

“Just before, on the under lip, is a cavity or hole, which the upper lip fits exactly into, as a knife into a sheath. I do really believe that he draweth in the water that he bloweth out through this hole, and so I have also been informed by seamen. Within his mouth is the whalebone, all hairy as a horse's hair, and it hangs down from both sides all about his tongue. The whalebone of some whales is somewhat bended like a cimeter, and others like a half-moon. The smallest whalebone is before, in his mouth, and behind towards his throat, and the middlemost is the largest and longest, being sometimes about two or three men's length, from whence may be conjectured how large the animal must be. On one side, all in a row, there are two hundred and fifty pieces of whalebone, and as many on the other, making in all five hundred, and there are still many more, for the cutters let the least of all remain, because they cannot easily come at it to cut it out, on account of the meeting of the two lips, where the space is very narrow. The whalebone is in a flat row, one piece by the other, somewhat bending within and towards the lips, every where like a half-moon. It is broad at the top, where it sticketh fast to the upper lip, every where overgrown with hard white sinews towards the root, so that between two pieces of whalebone you may put your hand. These white sinews are of an agreeable smell, break very easily, and may be boiled and eaten. Where the whalebone is broadest, is underneath by the root, there groweth small whalebones, the other greater, as you see small and large trees one among another in a wood. I believe the small whalebone doth not grow bigger, is one might think that some of the great pieces thereof might come out, and that so this small whalebone might come up again in the room thereof, or as, in children, the hair grows again when cut, but it is not so, for it is from one end to the other of an equal thickness, and full of long jacks, like horse's hair. The whalebone is underneath narrow and pointed, and all overgrown with hair, that it may not hurt that which is young, but, without, the whalebone hath a cavity, for it is turned just like unto a gutter wherein the water runs, where it lieth the one over the other, like the shields or plates of crawfish, or the pantiles of a house that lie one over the other, for else it might easily wound or hurt the under lip.

“To cut the whalebone out is a particular trade, and abundance of iron tools are used in the process. The lower part of the whale's mouth is commonly white. The tongue, which is about the size of a great feather-bed, lieth among the whalebone, being very closely tied to the undermost chap or lip. It is white with black spots at the edges, and consists of a soft, spongy, fat substance, which cannot easily be cut, being at once tough and yielding, so that it is thrown away by the whale-catchers for this reason, otherwise they might get five, six, or seven barrels of oil from it. Upon

the head is the hofel, or bump before the eyes and fins, and at the top of it are situated the spout-holes, one on each side over against each other, shaped like the letter S, or the hole on each side a violin. From these holes the whale bloweth or spouteth the water, herce of all when he is wounded, when it sounds like the roaring of the sea in a great storm, or as we hear the wind in very tempestuous weather. It may be heard at a league's distance, though you cannot see the fish by reason of the thick and foggy air.

“The head is not round at the top, but somewhat flat, and goes down sloping, like the tiling of a house, to the under lip. The under lip is broader than any part of the body, and broadest of all in the middle. In a word, the whole fish is shaped like a shoe-maker's last, if you look upon it from beneath. Behind the knob or bump, between that and the fins, are placed the eyes, which are not much bigger than those of a bullock, with eye-lids and hair like the human eyes. The crystal (crystalline humour) is not much bigger than a pea, clear and transparent as crystal. The eyes of the whale are placed very low, almost at the end of the upper lip. Some bring with them from Spitzbergen some bones which they call the ears of the whale, but this I can say nothing to, because I never saw any, but very well remember that I have heard that they lie very deep. The whale doth not hear when he spouts the water, wherefore he is easiest to be struck at that time. His belly and back are quite red, and underneath the belly they are commonly white, yet some are coal black. Most of those which I saw were white. They look very beautiful when the sun shines upon them, the small clear waves of the sea, that are over him, glistening like silver. Some of them are marbled on the back and tail. Where a whale has been wounded there remaineth always a white scar. I understood from one of our harpooners that he once caught a whale at Spitzbergen that was white all over. Half white I have myself seen, but one above the rest, which was a female, was a very beautiful one, she was all over marbled black and yellow. Those that are black are not all of the same colour, for some are as black as velvet, others coal black, and others of the colour of a tench. The whale loseth its beautiful colours when it grows dry, the black becoming brownish, and the white losing its clearness. When they are well they are as slippery as an eel, but one may stand upon them, because they are so soft that the flesh giveth way to our weight. The outward skin is thin, like parchment, and is easily pulled off by the hand when the flesh grows hot by the fermentation of the inward parts after the animal's death. The bones of the whale are hard, like those of large four-footed beasts, but porous like a sponge, and filled with marrow, and when that is consumed out they will retain a great quantity of water, for the holes are large, like those of an honeycomb. Two great and strong bones hold up the upper lip, they lie one against the

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other, and both together make a figure like a half-moon, but one by itself is like a quarter of a circle. Some of these I have seen lying on the coast of Spitzbergen, about twenty feet long, of a white colour, as if calcined. The flesh of the whale is coarse and hard, like that of a bull, it is intermixed with many sinews, and is very dry and lean when boiled, because the fat is only between the flesh and skin. If suffered to lie a little, it soon becomes black and tainted. That of the tail boils the tenderest, and is not quite so dry as that of the body. When we have a mind to eat of a whale, we cut great pieces off before the tail, where it is four-square, and boil it like other meat, good beef I prefer far before it, yet rather than be starved I advise to eat whale's flesh, for none of our men died of it, and the Frenchmen did eat it almost daily, singeing it on the tops of their tubs, and letting it lie till it was black, and yet eating it in that condition. The flesh of the whale, like that of seals, is alone or by itself, and the fat at the top thereof between the flesh and skin. The fat is about six inches thick on the back and belly, but I have also seen it a foot thick on the fins, and more than two feet on the under lip, but whales vary in this respect like other animals, according to size and health.

"In the fat are interspersed little sinews, which hold the oil as a sponge does water which one may squeeze out, the other strong sinews are chiefly about the tail, where it is thinnest, for with it he turns and winds himself about, as a ship is turned by the rudder, his fins being his oars, and according to his size he rows himself along with them as swiftly as a bird flies, and makes a long track in the sea, as a great ship doth when under sail, so that it remains divided for a while. Over the fat is, besides the uppermost skin already described, another skin about an inch thick, proportionable to the size of the whale. It is coloured according to the colour of the animal, if the whale be black this is black also, if, on the contrary, the outward or parchment-like skin be white or yellow, the thick under skin is of a similar colour. This thick skin is not tough or tenacious, but of a fungous texture, and of no use as an article of trade. The food of the whale is believed to be small sea-snails (the *chylacina* of Linnæus) which float in vast abundance on the surface of the northern seas. Whether these afford such great nourishment I cannot tell. I have been informed by others that about Shetland a small whale was caught which had about a barrel of herrings in its belly. The middling sized whales caught at Spitzbergen afford seventy, eighty, or ninety carrels of fat. Our biggest whale was fifty-three feet long, and his tail three fathoms and a half broad. The whale swims against the wind, like most of this tribe, and indeed as most large fishes do. They are sometimes found diseased and emaciated, having their peculiar disorders like other animals. The breasts of the female resemble those of a cow, having similar nipples,

the females are sometimes white and sometimes spotted with black and blue spots, in the manner of a plover's egg."

To this we shall add, that the cub, when protruded at the end of nine or ten months, the full time of parturition, is black and about ten feet long. The mutual tenderness of the male and female for each other, as well as of the latter for its offspring, is exceeded by no tribe of animals. The male will seldom or never quit the female if wounded, but join in her resistance, and share her fate, nor will the female quit its wounded cub, but partake of its death or ensure its victory.

The whale is taken by being struck with harpoons by several persons, who pursue him in boats, arranging their dyes according to circumstances, and wounding the animal repeatedly, till faint with loss of blood, he at length expires and lies floating on the surface. The harpoon is a sharp iron in the form of an arrow head, fixed to a rod, and furnished with a vast length of line of a proper strength. The wounded whale swims away, often drawing both boat and line after him as swift as the wind, spouting the water with violence, and tinging the sea all around with his blood. The noise, says Martens, may be heard as far as a cannon, but after having received several wounds at different intervals, it grows weaker, till at length it resembles that of the wind blowing slightly into an empty vessel.

This is a dangerous occupation, and requires great dexterity on the part of the adventurers. A long boat, continues our author, he valueth no more than dust, for he can beat it all in shatters at a blow. The desire of gain however is a sufficient temptation to those who undertake this fishery, and the profits seldom fail to recompense their labours. We believe the common mode of pay is dependant upon the success that may be met with.

Though the chief residence of this and most other whales is in the polar regions, yet they sometimes stray into more temperate latitudes, and are occasionally seen in very different parts of the ocean from those in which they generally reside. Of the other species our account must be short, as it is needless that we should be very minute, and they are less useful in common life, and consequently less sought for in commerce.

**B** Physalus, fin-fish, or fin-backed mysticete; has spiracles double on the middle of the fore part of the head, at the extremity of the back a soft fin. Inhabits the American and European seas, equalling the great mysticete in length, but much more slender and less fat, mouth larger, whalebone shorter, blue, ejects water from the spiracles with still greater force, body brown, shining, beneath white, dorsal fin straight, acute, from three to four feet long.

**B** Boops, pike-headed whale or mysticete, is characterised by spiracles double on the snout, a horny protuberance at the extremity of the back. Inhabits the north and south oceans, forty-six feet long, very smooth, black, belly white, longitudinally wrinkled. Head

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oblong; snout sharpish, tongue five feet long, like that of an ox, eyes placed near the angles of the mouth

**B Gibbosa** Hump-whale, or knobbel mysticete Back gibbous without dorsal fin There are two varieties *a*, with a single hump or bunch on the back, *b*, with six bunches on the back Inhabits the coasts of New England, and its gibbosity is about the size of the human head It has not been hitherto described accurately

**B musculus** broad-nosed whale, or under-jawed mysticete Spiracles double on the forehead, under jaw very broad Inhabits the coasts of Scotland, seventy eight feet long

• **B rostrata** beaked whale, rostrated mysticete Nose elongated to a peak dorsal fin fat Inhabits the seas of Norway, rarely of England, twenty-five feet long, very black, resembles *b* hoops, swims rapidly

**BALANARUM**, in entomology, a species of phalangium, with two feelers and an ovate body

**BAI AGATE**, a province of Mogulstan, the largest of the three that compose the kingdom of Decan

**BALAGATE MOUNTAINS**, those mountains which divide the Malabar from the Comandel coast

**BALAGNA**, a small province in the northern part of the island of Corsica

**BALANCE**, *s* (*balance*, Fr) Used in various senses 1 A pair of scales, 2 The act of comparing two things, 3 The overplus of weight, 4 Equipoise Of the first of these, as well as some others, we must speak more fully below

**BALANCE**, or **BALLANCE**, in mechanics, a peculiar application of that simple mechanical power called the lever, by which it is rendered useful in determining the difference or equality of weights in heavy bodies, and consequently their masses or quantities of matter The characteristic difference between a balance and a lever we conceive to consist in this, that the former is suspended from something which is above it, the latter supported by a prop or fulcrum below it

There are two kinds of balances, the ancient and the modern The ancient or Roman balance, called also *statera Romana* or steelyard, consists of a lever onbeam, moveable on a centre, and suspended near one of its extremes, on one side the centre are applied the bodies to be weighed, and their weight is measured by the division marked on the beam, on the other side is the place where a weight moveable along it keeps the balance in equilibrio This kind of balance is still frequently used in weighing heavy bodies, as butcher's meat, &c It may be so contrived as to determine very great weights with convenience and accuracy (See **STEELEYARD**) The modern balance consists of a lever or beam suspended exactly by the middle, to the extremes whereof are hung scales or basons

In each case the beam is called the *jugum*, and the two moities thereof on each side the

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axis, the brachia or arms, and the handle whereby it is held, *trutina*, the line on which the beam turns, or which divides its brachia, is called the axis, and, when considered with regard to the length of the brachia, is esteemed but a point, and called the centre of the balance, and the places where the weights are applied, the points of suspension or application That slender part perpendicular to the *jugum*, whereby either the equilibrium or preponderancy of bodies is indicated, is called the tongue of the balance In the Roman balance, therefore, the weight used for a counterbalance is the same, but the points of application are various, in the common balance the counterpoise is various, and the point of application the same The principles on which the use of each is founded may be readily understood from the following observations, and the general properties of the lever

The beam, fig 1 pl 22 if suspended from a hook or nail by the ring *k*, which is connected with its centre of motion will be a lever of the first kind, and its mechanism will depend upon the properties of that power Hence, as the quantity of matter, or proportional known weight, is to its distance from the centre of motion, so is the distance of the unknown weight to its quantity of matter Thus *AB*, fig 1 representing an instrument of this kind, *a*, the *trutina* or handle on which the beam turns, *k*, a ring on which the balance may be suspended on a nail or hook, *f*, the hook on which the body to be weighed is hung, *c*, a collar or guard by which the hook *f* is fastened to the beam, *g*, a moveable collar, *h*, a swivel, *i*, the counterpoise From what has been said it evidently follows, that if the body to be weighed be fastened to the hook *f*, and the whole suspended by the ring *k*, the division on which the counterpoise is placed to maintain an equilibrium in the balance, will show the weight of the body required, provided the weight of the counterpoise *i* be known, and the large divisions 1, 2, 3, &c be equal to the distance between the centre of the balance and the screw which fastens the guard *c* to the shorter arm of the balance It will also be necessary that the steelyard itself, with its whole apparatus, exclusive of the counterpoise, be in equilibrio when suspended on the ring *k* If the body to be weighed be heavier than the divisions on the longer arm will indicate, the balance is turned the lower side upwards, and suspended on the other ring *b*, by which means the divisions become shorter, because the distance between the *trutina* *d*, and the screw on which the guard *c* moves, is less the divisions in the figure on this side extending to 17, whereas they extend only to 6 on the other It will be unnecessary perhaps to observe, that the same precaution, with regard to the centre of gravity when the balance is suspended, is also necessary when this side of the balance is used, as we before mentioned with regard to the other

The modern balance, which, as before ob-



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served, has equal brachia or arms, is represented in fig 2. If the arms be equal both in weight and length, as they always are where no deception is intended, equal weights placed in the scales will keep the whole in equilibrio. If the centre of such a balance, scales and weights, be in the centre of motion B, an equilibrium obtains in every position of the balance, but if this centre be above or below B, the balance cannot be perfect, till the right line joining B and this centre be perpendicular to the horizon. The best position, therefore, of the centre of gravity is below B, and as little below it as possible, that the arcs described by it during its vibration may be small and soon described. The points of suspension, A and C, should be in the same right line with the centre of motion. The equilibrium of the balance will be affected by the tongue B<sub>o</sub>, unless it be continued below the centre of motion, so that the moments on both sides may be equal and opposite. Since the moment of a given body varies with its distance from the fulcrum, the longer the arms of the balance are (within convenient limits), the more distinguishable will be the effects of slight differences in the weights at D and E. Minute differences of weight are also rendered more discernible by diminishing the friction upon the axis, as by suspending it in a fork, with springs, &c. &c.

*The Deceitful Balance* operates in the same manner as the steelyard, and cheats or deceives by having one arm a little longer than the other, though the deception is not perceived because the shorter arm is made somewhat heavier, so as to compensate for its shortness, by which means the beam of the balance, when no weights are in the scales, hangs horizontal in equilibrio. The consequence of this construction is, that any commodity put in the scale of the longer arm, requires a greater weight in the other scale to balance it, and so the body is fallaciously accounted heavier than it really is. But the trick will easily be detected by making the body and the weight change places, removing them to the opposite scales, when the weight will immediately be seen to preponderate. The true weight will be a geometrical mean proportional between the two false weights.

*The Bent Lever Balance* is represented in fig 3. Here ABC is a bent lever supported on its axis B in the pillar IH. At A is suspended the scale F, and a C is affixed a weight or a heavy knob. Draw the horizontal line KBG through B, the centre of motion, on which from A and C let fall the perpendiculars AK, CD, then, if BK and BD are reciprocally in proportion to the weights at A and C, they will be in equilibrio, but if not, the weight C will move one way or other along the arc FG, till that ratio be obtained. If the lever be so bent that when A coincides with the line GK, C coincides with the vertical line BH, then as C moves along from F to G, its momentum will increase, whilst that of a weight in the scale E will decrease,

hence, the weights in E corresponding to different positions of the balance, may be expressed on the graduated arc of the plate FG, and the whole may be used in the same way as a steelyard.

*Compound Balance* is a combination of two, three, or more balances, serving for the weighing of very heavy weights, as anchors, great guns, &c. In such balances the power is to the weight, as the product of the lengths of the arms lying on the contrary sides of the fulcrum to the power, to the product of the length of the other arms.

*Danish Balance* is a kind of balance or steelyard in common use upon various parts of the continent of Europe. It consists of a beam of hard wood, having a heavy lump or knob at one end, and a swivel hook at the other. The goods to be weighed are suspended on the hook, and the whole is carried in a loop of whip cord, in which it is slidden to and fro (when placed horizontally), till the goods suspended from the hook at one end are balanced by the knob at the other. The weight of the goods is estimated by the contact of the loop with a scale of divisions in harmonic progression. For the construction of this scale, with diagrams, see Gregory's Mechanics, vol. II p. 99.

*Balance for Woollen Manufacturers* resembles the beam of a common pair of scales applied to a brass graduated ring, whose centre is the centre of motion of the beam. At one end of the beam is a fixed weight or counterpoise, at the other a hook. In sorting the skins of worsted, that to be examined is put upon the hook, and sinks down more or less, according to its weight, till the counterpoise by rising balances it, and then the index or cock of the beam points out, on the graduated arch, the number of skains of that kind which go to the pound. This balance was invented by the Rev. W. Ludlam, who has pointed out the minutiae of its construction in the Phil. Trans. vol. IV. See also part XLVI of the new abridgment by Dr. Hutton, &c.

*Assay Balance*, a very delicate balance used for determining the exact weight of minute bodies in the different processes of assaying, and may often be employed with advantage in chemical analysis, when extreme accuracy is required. This balance should be made of the best steel and highly polished, and as, from its delicacy, it is tremulous with the least motion of the air, as well as rendered false by the adhesion of dust, it is necessary to enclose it in a case, as represented in fig 5 pl. 22 having glasses, *a, a, a*, at top and all round it, in order to observe what is within. By moving the little weight or ring *b*, which is connected with the balance by means of a string, the balance itself is either lifted up or let down. The bodies to be weighed and the weights themselves are put into small silver dishes, which must weigh exactly alike, and which, when loaded, must be placed carefully in the scales, through the side windows, which slide or open for the purpose. When any thing is to be added to or

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taken out of them it is done with the small pinners, or if it be powder, with the small shovel or spoon but the balance must be let down every time, that the scales may rest upon the bottom of the case; and the windows must be shut before the balance is lifted up again, especially if the air is not perfectly calm. Citizen Prony has invented a support for assay and other balances of all dimensions, which renders their operations very expeditious and accurate. It is described in *Annales de Chimie*, xxxvi 50, also in Nicholson's *Journal*, 4to, vol v 303, and in Gregory's *Mechanics*, vol ii p 91.

*Hydrostatic Balance*, an instrument contrived to determine accurately the specific gravity of both solid and fluid bodies. It is constructed in various forms, but we shall content ourselves here with describing that which appears of all others the most accurate. VCC in fig 4 pl 22 is the stand or pillar of this hydrostatic balance, which is to be fixed in a table. From the top A hangs, by two silk strings, the horizontal bar BB from which is suspended, by a ring *r*, the fine beam of a balance *b*, which is prevented from descending too low on either side by the gently springing piece *xyz*, fixed on the support M. The harness is annulated at *o*, to show distinctly the perpendicular position of the examen, by the small pointed index fixed above it.

The strings by which the balance is suspended, passing over two pulleys, one on each side the piece at A, go down to the bottom on the other side, and are hung over the hook at *t*, which hook, by means of a screw P, is moveable about one inch and a quarter, backward and forward, and therefore the balance may be raised or depressed so much. But if a greater elevation or depression be required, the sliding piece S, which carries the screw P, is readily moved to any part of the square brass rod VK, and fixed by means of a screw.

The motion of the balance being thus adjusted, the rest of the apparatus is as follows. HH is a small board, fixed upon the piece D, under the scales d and e, and is moveable up and down in a low slit in the pillar above C, and fastened at any part by a screw behind. From the point in the middle of the bottom of each scale hangs, by a fine hook, a brass wire *ad* and *ac*. These pass through two holes *mm* in the table. To the wire *ad* is suspended a curious cylindric wire *rs*, perforated at each end for that purpose. This wire *rs* is covered with paper, graduated by equal divisions, and is about five inches long.

In the corner of the board at E is fixed a brass tube, on which a round wire *hl* is so adapted as to move neither too tight nor too free, by its flat head I. Upon the lower part of this moves another tube Q, which has sufficient friction to make it remain in any position required to this is fixed an index T, moving horizontally when the wire *hl* is turned about, and therefore may be easily set to the graduated wire *rs*. To the lower end of the wire *rs*

hangs a weight L, and to that a wire *pn*, with a small brass ball *g* about one fourth of an inch diameter. On the other side, to the wire *ac*, hangs a large glass bubble R by a horse hair.

Let us first suppose the weight L taken away, and the wire *pn* suspended from *b* and, on the other side, let the bubble R be taken away, and the weight F, suspended at *c*, in its room. This weight F we suppose to be sufficient to keep the several parts hanging to the other scale in equilibrium, at the same time that the middle point of the wire *pn* is at the surface of the water in the vessel O. The wire *pn* is to be of such a size that the length of one inch shall weigh four grains.

Now it is evident, since brass is eight times heavier than water, that for every inch the wire sunk in the water, it will become half a grain lighter, and half a grain heavier for every inch it rises out of the water. Consequently, by sinking two inches below the middle point, or rising two inches above it, the wire will become one grain lighter or heavier. Therefore, if when the middle point is at the surface of the water in equilibrio, the index T be set to the middle point *a* of the graduated wire *rs*, and the distance on each side *ar* and *as* contains 100 equal parts; then, if in weighing bodies the weight is required to the hundredth part of a grain, it may be easily had by proceeding in the following manner.

Let the body to be weighed be placed in the scale d. Put a weight into the scale e, and let this be so determined, that one grain more shall be too much, and one grain less too little. Then the balance being moved gently up or down, by the screw P, till the equilibrium be nicely shewn at *o*, if the index T be at the middle point *a* of the wire *rs*, it shows that the weights put into the scale e are just equal to the weight of the body. By this method we find the absolute weight of the body the relative weight is found by weighing it hydrostatically in water, as follows.

Instead of putting the body in the scale e, as before, let it hung with the weight I, at the hook *c*, by a horse-hair, as at R, supposing the vessel N of water were away. The equilibrium being then made, the index T standing between *a* and *r*, at the 36 division, shows the weight of the body put in to be 1095,36 grains. As it thus hangs, let it be immersed in the water of the vessel N, and it will become much lighter: the scale e will descend till the beam of the balance rest on the support *a*. Then suppose 100 grains put into the scale d restore the equilibrium precisely, so that the index T stand at the 36 division above *a*, it is evident that the weight of an equal bulk of water would, in this case, be exactly 100 grains. After a like manner, this balance may be applied to find the specific gravity of liquids, as is easy to conceive from what has been already said.

*Balance of a Clock or Watch* is that part

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which, by its motion, regulates and determines the beats. The circular part of it is called the rim, and its spindle the verge, there belong to it also two pallets or nuts, that play in the fangs of the crown-wheel in pocket watches, that strong stud in which the lower pivot of the verge plays, and in the middle of which one pivot of the crown-wheel runs, is called the potence the wrought piece which covers the balance, and in which the upper pivot of the balance plays, is the cock, and the small spring in the new pocket watches is called the regulator. The motion of a balance, as well as that of a pendulum, being alternate, while the pressure of the wheels is constantly in one direction, it is obvious that some art must be used to accommodate the one to the other. When a tooth of the wheel has given the balance a motion in one direction, it must quit it, that it may get an impulsion in the opposite direction. The balance or pendulum thus escaping from the tooth of the wheel, or the tooth escaping from the balance, has given to the general construction the name of scape-ment among our artists. (See *SCAPEMENT*.) Before the admirable invention of the pendulum, clocks were regulated by an horizontal balance having a vertical axis, that passed through two holes, with liberty to play up and down, and that suspended by means of a string passed through a hole in the axis and fastened at both ends, so as to form equal angles with the axis itself. Consequently, when the balance revolved in one direction, the string was wound upon the verge, and, being thus shortened, raised it up until the weight of the balance had overcome the force of rotation after which it revolved the contrary way, and descended to perform a similar ascent by winding the string the opposite way.

*Balance of Power*, a term which implies the general system of international relations, which has grown up in modern Europe. To one class of politicians this term has afforded a constant subject of ridicule and invective, and to another class the frequent opportunity of defending or attacking every measure, of discussing, or affecting to discuss, every political subject by a reference to certain terms of art, of which but few understand the meaning and force. It is not in the mere plan of forming offensive or defensive alliances, or in the principle of attacking a neighbour, in order to weaken his power, before he is betrayed hostile views, or in the policy of defending a rival, in order to stay, in proper time, the progress of an enemy it is not in these simple maxims that the modern system consists. These are, indeed, the elements, the great and leading parts of the theory, they are its most prominent features, they are maxims dictated by the plainest and coarsest views of political expediency but they do not form the whole system, nor does the knowledge of them (for it cannot be pretended that ancient states were in possession of any thing beyond the speculative knowledge of them), comprehend an ac-

quaintance with the profounder and more subtle parts of modern policy. The grand and distinguishing feature of the balancing theory, is the systematic form to which it reduces those plain and obvious principles of national conduct, the perpetual attention to foreign affairs, which it inculcates, the constant watchfulness over every motion in all parts of the system which it prescribes, the subjection in which it tends to place all national passions and antipathies to the views of remote expediency, the unceasing care which it dictates of nations most remotely situated, and apparently unconnected with ourselves, the general union which it has effected of all the European powers in one connected system—obeying certain laws, and actuated in general by a common principle, in fine, as a consequence of the whole, the right of mutual inspection, now universally recognised among civilized states, in the rights of public envoys and residents. This is the balancing theory. It was as much unknown to Athens and Rome, as the Keplerian or Newtonian laws were concealed from Plato and Cicero. It has arisen, in the progress of science, out of the circumstances of modern Europe—the greater extent and nearer equality of the contiguous states—the more constant intercourse of the different nations with each other. We have been told by Robertson and other historians, that the principle of the balance of power was a discovery of the 15th century, made by the Italian politicians, in consequence of the invasion of Charles VIII. Against such statements we might adduce the arguments of Mr. Hume and others, who have traced in ancient times vastly more refined notions of policy than any that dictated the Italian defensive league. It was not, in truth, to any such single event that the balancing system owed either its origin, or its refinement, but to the progress of society, which placed the whole states of Europe in the same relative situation in which the states of Italy were at that period, and taught them not to wait for an actual invasion, but to see a Charles at all times in every prince or commonwealth that should manifest the least desire of change. *Edinburgh Review*, vol I p 354.

*Balance of Trade* denotes an equality between the value of commodities bought of foreigners, and the value of the native productions transported into other nations. It is necessary that this balance be kept in trading nations, and if it cannot be made in commodities, it must in specie. Hereby it is, that we know whether a nation gains or loses by foreign trade, or any branch thereof, and consequently, whether that nation grows richer or poorer. There are divers methods of arriving at this knowledge, but the specific rules are too complex to be satisfactorily explained here.

*Balance*, in commerce, that which is wanting to make the two sides of an account even. In the method of book-keeping by double-entry, if the debets and credits as arising from

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every account, real and fictitious, be set in two separate columns, and added up, the sums arising thence will always balance, or be equal to each other, if the accounts are correctly kept

To BALANCE *v a* (*balancer*, Fr) 1

To weigh in a balance (*l Estrange*) 2 To keep in a state of just proportion 3 To counterpoise (*Newton*) 4 To regulate in account (*Locke*) 5 To pay that which is wanting (*Prior*)

To BALANCE *r n* To hesitate, to fluctuate between equal motives (*Locke*)

BALANCER *s* (from *balance*) The person that weighs any thing

BALANCING, among seamen, a singular method of contracting or reducing a sail in a tempest, in contradistinction to reefing, which is common to all the principal sails, whereas none are balanced but the mizen and mainsails set on booms

BALANCER, a machine used in striking of coins, &c See COINAGE

BALANUS MYRFPICA See BEN NUX

BALASORE, a sea-port town on the Bay of Bengal in the East Indies It is seated on a very fruitful soil The inhabitants make several sorts of stuffs of silk, cotton, and a kind of grass Lat, 21 20 N Lon 86 0 E

BALAUStINE See PUNICA

BALAUStINE FLOWER See GRANATUM

BALAUStIUM, (*balaustum*) Flores balaustiorum Balaustine flower, as in the preceding article A large rose-like flower, of a deep red colour, the produce of the plant from which we obtain the granatum See GRANATUM

BALBFC, or BALBFCK, a town of Asiatic Turkey, in Syria, celebrated by the ancients under the name of Iliopolis, is situated at the foot of the Anti-Libanus There are now to be seen large remains of one of the most beautiful temples in the world, supposed to have been dedicated to the worship of the sun, both the ancient and present name of the place signifies the city of the sun, but by whom or when built is not accurately determined In the time of Augustus it was a garrison town of the Romans, and the present temple is said to have been built by Antoninus Pius, instead of the ancient one gone to decay Under Constantine it was neglected, and soon after turned into a Christian church, and continued so till the irruption of the Arabs, after that the church fell to decay, battlements were built round it, and from that time, being exposed to the fate of war, it fell rapidly to ruins The state of the city is not less deplorable added to the wretched government of the Turks, an earthquake in 1759 completed its destruction The inhabitants were computed at 5000 in 1751, which in the year 1784 were reduced to less than 1200, poor and indolent, cultivating a little cotton, maize, and water-melons, for their subsistence 110 miles S Aleppo, and thirty NNW Damascus Lat 34 22 N Lon 37 20 E

BALBUTIES, (*balbuties*, *balbus*, stam-

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mering) A defect of speech, and properly that sort of stammering in which the patient sometimes hesitates, and immediately afterwards speaks precipitately See PSEILISMUS

BALBYSIA, in botany, a genus of the class syngenesia, order polygamia superflua Receptacle chaffy, down sessile, feathery, calyx simple, eight leaved, florets of the ray three-parted One species only, a native of Mexico, with ascending bristly stems and yellow flowers

BALCONY, in architecture, a kind of open gallery made usually of wood or cast iron, fixed without the walls of buildings, and commonly about the middle of the front Balconies are generally contrived for the convenience of looking around, seeing processions, &c

BALD *a* (*bal*, Welsh) 1 Wanting hair (*Addison*) 2 Without natural covering (*Shakspeare*) 3 Unadorned, inelegant (*Dryden*) 4 Naked, without dignity (*Shakspeare*) 5 It was used by the northern nations to signify bold, and is still in use

BALDACHIN, in architecture, a canopy supported by pillars, with which altars are covered

BALDERDASH *s* rude mixture

To BALDERDASH *v a* To adulterate liquor

BALD-FACED, applied to a horse, when the greater part of his face is white

BALDIVIA, or VALDIVIA, a sea-port town of Chili, in South America It was built in 1551, by the Spanish general Baldivia, after he had conquered Chili The inhabitants amount to about 2,000 Lat 39 38 S Lon 73 20 W

BALDLY *ad* (from *bald*) Nakedly, meanly, inelegantly

BALDMONY *s* Gentian, a plant See MEUM ATHAMANTICUM

BALDNFSS *s* (from *bald*) 1 The want of hair 2 The loss of hair (*Swift*) 3 Meanness of writing, inelegance

BALDNFSS CALVIES, in medicine, a falling off of the hair, especially from the inciput, without being able to grow again, the moisture of the head, which should feed it, being dried up by some disease, old age, or the immoderate use of powder, &c It differs from alopecia, area, ophrasis, and tinea, as these all arise from some vice in the nutritious humour, baldness, from the defect of it But the distinction is not always observed by modern physicians When the eyes lids shed their hair, it is called a ptolosis

Buffon says that the crown of the head, and the space immediately above the temples, are the parts which first become bald, but that the hair below the temples, and on the inferior part of the back of the head, seldom falls off He adds, baldness is peculiar to men women, in the most advanced age, though their hair becomes white, are seldom affected with baldness

HALDOCK, a town of Hertfordshire, in England, chiefly noted for its trade in malt Lat 52 2 N 0 5 W

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**BA'LDRIK** *s* 1 A girdle (*Pope*) 2 The zadack (*Spenser*)

**BALE**, in commerce, a term denoting a quantity of merchandize packed up in cloth, and corded round very tight, after being secured with hay, &c. to preserve it from injury. A bale of cotton yarn is from 3 to 4 hundred weight, of raw silk, from 1 to 4 hundred, of lockram or dowlass, either 3, 3½, or 4 pieces. Bales should always be marked and numbered, that the merchants to whom they belong may easily know them.

**BALE-GOODS**, such as are exported or imported in bales.

**BALE** *s* (bæl, Sax.) Misery (*Spenser*)

To **BALE** *v* *a* (from *latter*, Fr.) To lave, to throw out.

To **BALE** *v* *n* (*emballer*, Fr.) To make up into a bale.

**BALLARES**, or **BALEARIC ISLANDS**, three islands in the Mediterranean, modernly called Majorca, Minorca, and Yvica, on the coast of Spain. The word is derived from βαλεῖν, *to throw*, because the inhabitants were expert archers and slingers, besides great pirates. —Florus relates that in these isles mothers never gave children their breakfast before they had struck with an arrow a certain mark in a tree.

**BA'LEFUL** *a* (from *lale*) 1 Full of misery, sorrowful (*Milton*) 2 Full of mischief, destructive (*Dryden*)

**BALEFULY** *ad* (from *baleful*) Sorrowfully, mischievously.

**BALES** (Peter) was a most famous master in the art of penmanship, or fair writing, and one of the first inventors of short-hand. He was born in 1547, and is styled by Anthony Wood "a most dexterous person in his profession, to the great wonder of scholars and others." He is recorded for his skill in micrography, or miniature writing, in Hollinshed's Chronicle, anno 1575, and Mr Evelyn also hath celebrated his wonderful skill in this delicate operation of the hand. "Hadrian Junius speaking as a miracle of somebody who wrote the Apostle's Creed, and the beginning of St John's Gospel, within the compass of a farthing, what would he have said, says Mr Evelyn, "of our famous Peter Bales, who, in the year 1575, wrote the Lord's Prayer, the Creed, Decalogue, with two short prayers in Latin, his own name, motto, day of the month, year of the Lord, and reign of the queen, to whom he presented it at Hampton court, all of it written within the circle of a single penny, inclosed in a ring and borders of gold, and covered with a crystal so accurately wrought, as to be very plainly legible, to the great admiration of her majesty, the whole privy-council, and several ambassadors then at court." He was farther very dexterous in imitating hand-writing, and about 1586 was employed by secretary Walsingham in certain political matters. We find him at the head of a school, near the Old Bailey, London, in 1590, in which year he published his Writing School-master, in three parts, the first teaching swift writing, the second true writing, the third fair

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writing. In 1595, he had a great trial of skill, in the Black Friars, with one Daniel Johnson, for a golden pen of 20*l* value, and won it, and a contemporary author farther relates, that he had also the arms of calligraphy given him, which are, azure, a pen, or, as a prize, at a trial of skill in this art among the best penmen in London. In 1597, here published his Writing Schoolmaster, which was in such high reputation, that no less than eighteen copies of commendatory verses, composed by learned and ingenious men of that time, were printed before it.

**BALESSAN**, in botany. See **BALSAM**.

**BALGUY** (John), a learned English divine, was born at Sheffield, in Yorkshire, in 1686; he received his education under his father, who was master of the grammar school at Sheffield. In 1702 he was admitted of St John's college, Cambridge, where he took his degrees in arts. On entering into orders, he obtained a living in the county of Durham, where he continued for many years. In the famous Bangorian controversy, Mr Balguy particularly distinguished himself on the side of bishop Hoadly, who, in return, gave him a prebendary in the church of Salisbury, in 1729, he was presented to the vicarage of Northallerton, in Yorkshire. He died at Harrowgate in 1748. Mr Balguy was a deep thinker, and an elegant writer, he wrote, besides his tracts in the Bangorian dispute, 1 A Letter to a Deist, concerning the Beauty and Excellence of Moral Virtue, 8vo 1720. 2 The Foundation of Moral Goodness, or a farther Enquiry into the Original of our Idea of Virtue, 1728. 3 Divine Rectitude, or a brief Inquiry concerning the Moral Perfections of the Deity, particularly in Respect of Creation and Providence, 1730. 4 An Essay on Redemption, 1741. 5 Sermons on several Occasions, 2 vols 8vo. The last of which is posthumous.

**BALI**, an island of the East Indies, forming the north side of the Straights of Java, through which the East India ships sometimes return in their passage from China to Europe. The inhabitants are Pagans, and very much addicted to war. Lat 7 10 S Lon 115 50 E.

**BALIGNIA**, a town of Novogorod, in Muscovy. Lat 57 2 N Lon 45 40 E.

**BALISTES** I. *ile fish*, in zoology, a genus of the class pisces, order brachiopterygia. Head compressed close to the body, with sometimes a spine between the eyes, mouth narrow, teeth in each jaw eight, of which the two anterior are longer, and three interior ones on each side, aperture of the gills narrow, above the pectoral fins, coverless, membranous two-rayed, body compressed, carinate on each side, rough, with very minute prickles, the scales joined together by the skin. None of the fishes of this genus inhabit the seas of Europe, they are able to inflate the belly, which at that time is rough, with very minute prickles, they feed on other fishes, and many of them are of a vast size most of them are suspected to be poisonous. Twenty-one species. (See Nat Hist pl XIV.) Of these the chief are •

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1. **B monoceros**, offering two varieties, but with a difference not important. Inhabits the seas of Asia and South America, one variety about a foot long, the other about three feet, feeds on young crabs, and polypes, body thin, varied with cinereous and brown the larger variety is poisonous.

2. **B pomentosus** Head-fin two-rayed, body a little hairy on the hind part, inhabits the Indian seas body thin, sides, on the upper part yellow, lower cinereous, beneath yellow, varied with oblong black spots.

3. **B aculeatus** First dorsal-fin three rayed, tail with recumbent spines at the sides. Inhabits the Indian and Red seas, feeds on young crabs, body covered with papillæ on the surface, disposed in an irregular quadrangle.

4. **B sinensis** Head with a single ray, ventral fin single. Inhabits the seas round Brasil and China, body broad, rough, sprinkled with small orange spots, cinereous at the sides, beneath whitish, flesh hardly eatable.

5. **B assati** Body mucronate with brown warts, tail with a triple row of black ones. Inhabits the Red sea, a span long, brown, belly white, vent black, surrounded by a tawny ring. flesh eatable, but insipid.

**BALK** *s* (*balk*, Dutch) A great beam.

**BAIK** *s* A ridge of land left unploughed.

**To BALK** *v a* (See the noun) 1 To disappoint, to frustrate (*Prior*) 2 To miss any thing (*Drayton*) 3 To omit, or refuse any thing (*Shakspeare*)

**BALK**, or **BALKH**, a province of Great Bukharia in Asia, about 360 miles long, and 250 broad, situated to the south of the province of Samarkand, and to the east of Bukharia Proper. It is the least of the three provinces that make up what is called Great Bukharia, but being extremely fertile and well cultivated the prince draws a great revenue from it. The country particularly abounds with silk, of which the inhabitants make pretty manufactures. The capital of this province is of the same name, and is thought by many to be the same as the ancient Bactra. Lat 37° 0' N. Lon 65° 20' E.

**BALKERS**, in the fishery, persons placed on rocks and eminences at sea to spy the herring shoals, and give notice to the fishermen where they may be found.

**BALL**, in a general sense, is a spherical and round body, whether naturally so, or formed into that figure by art. The term, when used in the military art, comprehends all sorts of bullets for fire-arms, from the cannon to the pistol. Cannon-balls are made of iron, musket-balls, pistol-balls, &c are of lead. The experiment has been tried of iron balls for pistols and fuses, but they are justly rejected, not only on account of their lightness, which prevents them from flying straight, but because they are apt to furov the barrel of the pistol, &c.

**BALL OF A PENDULUM**, the weight at the bottom. In shorter pendulums this is called the bob.

**BAIL**, in pyrotechnics, is also a composition of various combustible ingredients, serving to

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burn, smoke, give light, &c. In this sense we read of fire-balls, light-balls, smoke-balls, sunk-halls, sky-balls, water balls, land-balls.

**BALL**, among the Cornish miners, signifies a tin-mine.

**BALL**, among printers, a kind of wooden tunnel stuffed with wool, contained in a leather cover, which is nailed to the wood, with which the ink is applied on the forms to be wrought off. See **PRINTING**.

**BALI** *s* (*bal*, French) An entertainment of dancing.

**BALL AND SOCKET** is an instrument made of brass, with a perpetual screw, so as to move horizontally, vertically, and obliquely, and is generally used for the managing of surveying and astronomical instruments.

**CANNON BALLS** are distinguished by their calibres thus

A 42	6 684 inches
32	6 105
24	5 547
18	5 040
12	4 403
9	4 000
6	3 498
3	2 775
2	2 423
1	1 923

**HORSE-BALLS**, a form of medicine in use among farmers, similar to the boluses of the apothecary. They are well adapted for such medicines as operate in small doses, and as they dissolve with some difficulty, the effect produced by them must be more gradual and lasting than any other form of medicine, which circumstance should always be particularly considered, as it is of as great disadvantage in some cases as it is of service in others.

**BALLS**, (Martial), or **BALLS OF MARS**, in chemistry a preparation of iron now entirely disused in this form, but retuned in the materia medica as a powder. It is the ferrum tartarizatum, or tartar of iron.

**BALLS** (Mercurial), an amalgam of mercury and tin, formed by adding a quantity of mercury to an equal weight of melted tin, and pouring the fluid mass into a round and hollow mould. These balls were formerly used to purify water.

**BALL-VEIN**, a sort of iron ore common in Sussex, which, though it yields but a small quantity of metal, is yet wrought to great advantage, because it runs freely in the fire.

**BALLS**, in electricity, are two pieces of cork, or pith of elder, nicely turned in a lathe, to the size of a small pea, and suspended by fine linen threads, intended as electrometers, and of excellent use to discover small degrees of electricity, to observe the changes of it from positive to negative, and vice versa, and to estimate the force of a shock before the discharge, so that the operator shall always be able to tell very nearly before the discharge, by knowing how high he has charged his jars, what the explosion will be.

**BALLS OF FIRE**, in meteorology, a kind of luminous bodies generally appearing at a great

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height above the earth, with a splendour surpassing that of the moon, and sometimes equalling her apparent size. They generally proceed in this hemisphere from north to south with vast velocity, frequently breaking into several smaller ones, sometimes vanishing with a report, sometimes not.

These luminous appearances no doubt constitute one part of the ancient prodigies, blazing stars or comets, which last they sometimes resemble in being attended with a train, but frequently they appear with a round and well defined disk. The first of these of which we have any accurate account was observed by Dr Halley and some other philosophers at different places, in the year 1719. From the slight observations they could take of its course among the stars, the perpendicular height of this body was computed at about 70 miles from the surface of the earth. The height of others has also been computed, and found to be various, though in general it is supposed to be beyond the limits assigned to our atmosphere, or where it loses its refractive power. The most remarkable of these on record appeared on the 18th of August, 1783, about nine o'clock in the evening. It was seen to the northward of Shetland, and took a southerly direction for an immense space, being observed as far as the southern provinces of France, and one account says that it was seen at Rome also. During its course it appears frequently to have changed its shape, sometimes appearing in the form of one ball, sometimes of two or more, sometimes with a train, sometimes without one. It passed over Edinburgh nearly in the zenith, and had then the appearance of a well defined round body, extremely luminous, and of a greenish colour, the light which it diffused on the ground giving likewise a greenish cast to objects. After passing the zenith, it was attended by a train of considerable length, which continually augmenting, at last obliterated the head entirely, so that it looked like a wedge, flying with the obtuse end foremost. The motion was not apparently swift, by reason of its great height, though in reality it must have moved with great rapidity, on account of the vast space it travelled over in a short time. In other places its appearance was very different. At Greenwich we are told, that "two bright balls parallel to each other led the way, the diameter of which appeared to be about two feet, and were followed by an expulsion of eight others, not elliptical, seeming gradually to mutilate, for the last was small. Between each two balls a luminous serrated body extended, and at the last a blaze issued which terminated in a point. Minute particles dilated from the whole. The balls were tinted first by a pure bright light, then followed a tender yellow, mixed with azure, red, green, &c; which, with a coalition of bolder tints, and a reflexion from the other balls, gave the most beautiful variety and variation of colours that the human eye could be charmed with. The sudden illumination of the atmosphere, and the consequent singular transition of this bright lu-

minary, tended much to make it awful nevertheless the amazing vivid appearance of the different balls, and other rich connective parts not very easy to delineate, gave an effect equal to the rainbow in the full zenith of its glory."

Dr Blagden, in a paper on this subject in the 74th volume of the Philosophical Transactions, has not only given a particular account of this and other meteors of the kind, but added several conjectures relating to the probable causes of them. But the opinion which the doctor adopts, as the most probable, is, that the fireballs are great bodies of electric matter, moving from one part of the heavens, where to our conception it is superabundant, to another where it is deficient. In favour of this hypothesis he has adduced various arguments, which may be seen in the volume just referred to. See farther, the articles *AEROLITHS*, and *METEORIC STONES*.

Besides those we have mentioned, there are other fireballs much smaller and nearer the surface of the earth, rolling upon it, or falling upon it, exploding with violence, as is the case with those which appear in the time of thunder, and frequently produce mischievous effects. One of these is mentioned by some authors as falling in a serene evening in the island of Jamaica, exploding as soon as it touched the surface of the ground, and making a considerable hole in it. Another is mentioned by Dr Priestley, as rolling along the surface of the sea, then rising and striking the top-mast of a man of war, exploding, and damaging the ship. In like manner we hear of an electrified cloud at Java in the East Indies, whence, without any thunder storm, there issued a vast number of fireballs, which did incredible mischief. This last phenomenon points out to us the true origin of balls of this kind, viz an excessive accumulation of electricity in one part, or a violent tendency to circulate, when at the same time the place where the motion begins is at so great a distance, or meets with other obstacles of such a nature, that it cannot easily get thither. Urged on, however, by the vehement pressure from behind, it is forced to leave its place, but being equally unable to displace the great quantity of the same fluid, which has no inclination to move the same way with itself, it is collected into balls, which run hither and thither, according as they meet with conductors capable of leading them, into some part of the circle. This is even confirmed by an experiment related at the end of Dr Priestley's fifth volume on Air. He relates, that a gentleman having charged, with a very powerful machine, a jar, which had the wire supporting the knob of a considerable length, and passed through a glass-tube, a globe of fire was seen to issue out of it. This globe gradually ascended up the glass-tube till it came to the top of the knob, where it settled, turning swiftly on its axis, and appearing like a red-hot iron ball of three quarters of an inch diameter. On continuing to turn the machine, it gradually descended into the jar, which it had no sooner done, than there ensued a most violent explosion and



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flash, the jar being discharged and broken at the same time. This experiment, however, is singular in its kind, for neither the gentleman who performed it, nor any other, has yet been able to repeat it. Single as it is, we may yet gather from it, that a fireball will be the consequence of a very violent electrification of any substance, provided at the same time that the air be in a very non-conducting state, so that the electricity may not evaporate into it as fast as it is collected, for this would produce only lucid streams and flashes, as in the common experiments with the Leyden phial and it is probably an inattention to this circumstance which has hitherto prevented the repetition of the experiment above-mentioned. The case is the same in thunder storms, where an excessive accumulation of electric matter always produces fireballs, the most mischievous kind of lightning.

**BALLS**, or **BALLETS**, in heraldry, make a frequent bearing in coats of arms, though never so called, but having according to their several colours several names, as besants, when the colour is or, plates when argent, hurts when azure, torteaux when gules, pomeis when vert, pellets or agresses when sable, golpes when purple, oranges when tanne, and guzes when sanguine.

**BALLAD**, a kind of popular song, adapted to the capacity of the lower class of people, who, being highly charmed with this species of poetry, are thereby not a little influenced in the conduct of their lives. It consists usually of the recital of some action, adventure, or intrigue.

The French confine their ballads to stricter terms. A ballad, according to Richlet, is a song consisting of three strophes, or stanzas, of eight verses each, besides a half strophe, the whole in rhyme, of two, three, or four verses, with a burthen repeated at the end of each strophe, as well as of the half strophe. Some have suggested that a collection of ballads is necessary to a minister, in order to learn the temper and inclinations of a people, which are here frequently uttered with great simplicity. The great Cecil, chief minister to queen Elizabeth, is said to have made a most ample collection of ballads, on this account. A very ingenious political writer, Mr. Fletcher of Saltoun, says, that if he could but make the ballads of the nation, he would care very little who made the religion of it. There is a very curious collection of old English and Scottish ballads, published in 3 vols 8vo by Dr. Percy, in which, and in a dissertation prefixed to Dr. Aikin's Collection of Songs, &c the curious in this way may find abundance of entertainment and information.

**TO BALLAD** *verb* To make or sing ballads (*Shakspeare*)

**BALLAD-SINGER** *s* One whose employment is to sing ballads in the street (*Gay*)

**LLAN** See **LABRUS**

**ALLAST** any heavy matter, as stone, metal, iron &c deposited in the hold of a ship, in order to make her sink a proper depth

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in the water, that she may be capable of carrying a sufficient quantity of sail without over-setting.

There is often great difference in the proportion of ballast required to prepare ships of equal burden for a voyage, the quantity being always more or less according to the sharpness or flatness of the ship's bottom, which seamen call the floor. The knowledge of ballasting a ship with propriety, is certainly an article that deserves the attention of the skilful mariner, for although it is known that ships in general will not carry a sufficient quantity of sail till they are laden so deep that the surface of the water will nearly glance on the extreme breadth amidships, yet there is more than this general knowledge required, since, if she has a great weight of heavy ballast, as lead, iron, &c in the bottom, it will place the centre of gravity too low in the hold, and although this will enable her to carry a great sail, she will nevertheless sail very heavily, and run the risk of being dismasted by her violent rolling.

To ballast a ship, therefore, is the art of disposing those materials so that she may be duly poised, and maintain a proper equilibrium on the water, so that she may be enabled to carry a good sail, incline but little, and ply well to windward.

The following table will exhibit in one view the quantity of ballast allowed to ships of different sizes.

*Ballast allowed to the following ships*

Guns	Tonnage	Iron Tons	Single Tons
110	2200	180	370
100	2000	180	370
98	2110	160	350
90	1870	160	350
80	1620	140	300
74	1700	80	270
64	1370	70	260
50	1100	65	170
44	900	65	160
38	930	70	170
36	870	65	160
32	700	65	140
28	600	60	100
24	500	50	80
22	450	50	70
20	400	50	60
Sloop	300	50	40
Brig	160	30	15
Cutter	—	20	{ Seldom any
Sloop	—	15	

The iron ballast is first stored fore and aft, from bulk-head to bulk-head, then the shingle ballast is spread and levelled over the iron.

Masters of vessels are obliged to declare the quantity of ballast they bear, and to unload it at certain places. They are prohibited unloading their ballast in havens, roads, &c the neglect of which prohibition has ruined many excellent ports. All ships and vessels taking in

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ballast on the river Thames are bound to pay the corporation of the Trinity-house for every ton carried to any ship in the coal trade 1s and for every other British ship, 1s 3d for every ton carried to any foreign ship, 1s 7d The Trinity-house employ men, and regulate them, and their lighters are to be marked

**BALLET**, or **BALEF**, **BALETTA**, a kind of dramatic poem, representing some fabulous action or subject, divided into several entries, wherein several persons appear, and recite things under the name of some deity, or other illustrious character

**BALLET**, (from *ballare*, to cast,) is more particularly used for a kind of comic dance, consisting of a series of several airs of different kinds of movements, which together represent some subject or action

**BALLIAGE**, a duty paid to the city of London by aliens, for certain articles exported by them

**BALLISHANNON**, a large town of Donegal in Ireland, with a good haven Lat 54 33 N Lon 7 50 W

**BALLISTA**, a military engine in use among the ancients, somewhat like our cross bow, though much larger, and more forcible, it was used in the besieging of cities, to throw in stones, or sometimes darts and javelins The word is derived from the Greek *βαλλω*, to shoot, or throw Marcellinus describes the ballista thus, a round iron cylinder is fastened between two plunks, from which rises a hollow square beam placed cross-wise, fastened with cords, to which are added screws, at one end of this stands the engineer, who puts a wooden shaft with a big head, into the cavity of the beam, this done, two men bend the engine, by drawing some wheels when the top of the head is drawn to the utmost end of the cords the shaft is driven out

**BALLISTARI**, slingers in the ancient armies, or soldiers who fought with ballistæ

**BALLISTUM**, in antiquity, a military song and dance used on occasions of victory The ballistæ were a kind of popular ballads, composed by poets of the lower class, without much regard to the laws of metre

**BALLISTIC PENDULUM**, an ingenious machine invented by Mr Benjamin Robins, for ascertaining the velocity of military projectiles, and consequently the force of fired gun-powder It consists of a large block of wood, annexed to the end of a strong iron stem, having a cross steel axis at the other end, placed horizontally, about which the whole vibrates together like the pendulum of a clock The machine being at rest, a piece of ordnance is pointed straight towards the wooden block, or ball of this pendulum, and then discharged the consequence is this, the ball discharged from the gun strikes and enters the block, and causes the pendulum to vibrate more or less according to the velocity of the projectile, or the force of the blow, and by observing the extent of the vibration, the force of that blow becomes known, or the greatest velocity with which the block is moved out of its place, and

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consequently the velocity of the projectile itself which struck the blow and urged the pendulum

The more minute and particular description may be seen in Dr Hutton's Tracts, vol 1, where are given all the rules for using it, and for computing the velocities, with a multitude of accurate experiments performed with cannon balls, by means of which the most useful and important conclusions have been deduced in military projectiles and the nature of physics Dr H has also since that publication made many other experiments of the same kind, by discharging cannon balls at various distances from the block, from which have resulted the discovery of a complete series of the resistances of the air to balls passing through it with all degrees of velocity, from 0 up to 2000 feet in a second of time

**BALLOON**, or **BALLON**, in a general sense, signifies any spherical hollow body, of whatever matter it be composed, or for whatever purposes it be designed Thus, with chemists, balloon denotes a round short-necked vessel, used to receive what is distilled by means of fire, in architecture, a round globe on the top of a pillar, and among engineers, a kind of bomb made of pasteboard, and played off, in fire-works, either in the air or on the water, in imitation of a real bomb

*An Balloon See AEROSTATION*

**BALLOON**, among voyagers, denotes the state barges of Siam They are a kind of brigantine, and of great swiftness

**BALLOON**, in the French paper trade, a quantity of paper containing 24 reams

**BALLOON**, **BALLON**, or **BALLOT**, in the French glass-trade, a certain quantity of glass-plates, smaller or greater according to their quality The balloon of white glass contains twenty five bundles, of six plates per bundle, but the balloon of coloured glass is only of twelve and a half bundles, and of three plates to a bundle

**BALLOT** : (*ballote*, French) 1 A little ball or ticket used in giving votes, being put privately into a box or urn 2 The act of voting by ballot

*To BALLOT v n* (*balloter*, French) To choose by ballot (*Wotton*)

**BALLOTA** Black horehound In botany, a genus of the class didynamia, order gymnospermia Calyx salver shaped, ten-nerve, five-toothed, corol with the upper lip concave and crenate Three species

1 *B nigra*, with white flowers, common to the wastes of our own country

2 *B lanata*, with white woolly stem, and yellow corol Found in Siberia

3 *B disticha* with petioled serrate, downy leaves a native of India

**BALLOTADES**, in the manage, the leaps of a horse between two pillars, or upon a straight line, made with exactness of time, with the aids of the hands and the calves of the legs, and in such a manner that when his fore feet are in the air he shews nothing but the soles of his hind feet without striking out In this parti-

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**cular**, ballotades differ essentially from caprioles, for when a horse works at the latter, he jerks or strikes out his hind legs with all his might, keeping them near and even. Ballotades likewise differ from croupades, in as much as the horse when he lifts or raises his croop in performing the first of these shows his shoes, while in the latter he draws his hinder feet under him.

**BALLOTATION** *a* (from *ballot*) The act of voting by ballot (*Milton*)

**BALLOTING**, a method of voting at elections, &c by means of little balls usually of different colours, by the French called ballots, which are put into a box, and the party voting gives his suffrage privately.

**BALLUSTER**, a small pillar used for balustrades.

**BALLUSTRADE**, a series or row of ballusters, joined by a rail, serving is well for rest to the elbows as for a fence or inclosure to balconies, altars, staircases, &c. The heights of ballustrades vary according to circumstances. In apportioning the parts, it is best to divide the height into three unequal parts, eight of these for the height of the balluster, three for the base, and two for the cornice or rail, or perhaps into fourteen, giving eight parts to the balluster, four to the base, and two to the rail. One of these parts may be called a module, and being divided into nine minutes, may serve to determine the dimensions of the particular members.

In ballustrades, the distance between two ballusters should not exceed half the diameter of the balluster measured in its thickest part, nor be less than one third of it.

**BALLYCASTLE**, a town of Ireland, in the county of Antrim, situated on the east side of a bay to which it gives name with a good pier there is a colliery near it thirty miles N. Antrim Lat 55 12 N Lon 6 6 W Greenwich.

**BAILY COTTON**, a bay in St George's Channel, on the south-west coast of Ireland, in the county of Cork, north-west of Bally Cotton island 10 miles E Cork harbour.

**BALLY COTTON** an island, in St George's Channel, on the south-west coast of Ireland Lat 51 50 N Lon 7 59 W Greenwich.

**BALLYDONGAN**, a bay on the south coast of Ireland, in the county of Cork, on the south side of the entrance into Kenmare river.

**BALM** *a* (*baume*, French) 1 The sap or juice of a shrub, remarkably odoriferous (*Dryden*) 2 Any valuable or fragrant ointment (*Shakspeare*) 3 Any thing that soothes pain (*Shakspeare*)

**BALM** See **BAUM**

**BALM OF GILEAD** See **AMYRIS**

**BALM OF GILEAD** (False) See **DRACONEPHALON**

**BALM OF GILEAD FIR** See **BALSAMEA**

**BALM OF MECCA** See **AMYRIS**

**BALM** (Turkey) See **AMYRIS**

**To BALM** *v a* (from the noun) 1 To

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anoint with balm (*Shakspeare*) 2 To soothe; to mitigate (*Shakspeare*)

**BALMY** *a* (from *balm*) 1 Having the qualities of balm (*Milton*) 2 Producing balm (*Pope*) 3 Soothing, soft (*Dryden*) 4 Fragrant, odoriferous (*Dryden*) 5 Mitigating, assuasive (*Shakspeare*)

**BALNEARIUM SERVI**, in antiquity, servants or attendants belonging to the baths.

**BALNEARIUS FUR**, in antiquity, a thief who practised stealing the clothes of persons in the baths, sometimes also called fur balnearum.

**BALNARY** *s* (*balnearium*, Latin) A bathing room (*Brown*)

**BALNEATION** *s* (from *balneum*, Lat) The act of bathing (*Brown*)

**BALNEATORY** *a* (*balneatorius*, Lat) Belonging to a bath.

**BALNEUM**, bath, in chemistry, a contrivance to modify and regulate the heat in various chemical processes, particularly distillations, by the use of different intermedia. When the degree of heat required is below that of boiling water, a vessel containing that fluid is interposed between the fire and the substance to be acted upon, and when a superior degree of heat is necessary, sand or some other matter of a similar nature is employed.

There were formerly many kinds of balnea in use, especially among the alchemists, as ash bath, dung-bath, &c but the three following are the only ones now retained. Their advantage is considerable, and the manner of employing them is obvious from their construction.

1 **Balneum aque**, or water bath, is of great use in the distillation of essential oils, of the aromatic part of vegetables, of the finer kinds of ardent spirits, in evaporating to dryness the solutions of vegetables employed in medicine whose virtue would be lost by any excess of heat, and in many other processes. Any vessel of water, capable of being heated to boiling, and of containing a retort, will answer this purpose, but the heat of the substance immersed in it will be something less than that of the water. If a solution of salt be used instead of water only, with a view of raising the temperature to the boiling point, or higher, the apparatus is called *balneum marie*, or rather, perhaps, *balneum maris*, from the use of sea-salt or brine.

2 **Balneum siccum**, or the vapour bath, is not at present much used in chemistry, but it is employed in various forms for culinary purposes. In this bath, the vessel to be heated is exposed to the steam of boiling water, which is enclosed in a kind of case for the purpose.

3 **Balneum arenae**, sand bath, the most useful of all. The vessel to contain the sand is generally of cast iron, which being gradually heated communicates the heat to every vessel buried in the sand. The sand should be of mudding fineness, that the heat may be more gradually distributed. Those distillations

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which, at any part of the process, require as much as a low red heat, are usually performed in sand baths, even in manufactures in the great way.

**BALSAM** (*Βάλσαμον*, from *βαλν*, *laol sa-men*, the prince of oils, Heb.) A fluid, odorous, combustible substance, that communicates a sweet taste to water, and contains a concrete acid, which may be obtained by sublimation or decoction. Chemists are not agreed as to the difference between balsam and resin.

**BALSAM** (Artificial) Compound medicines are thus termed which are made of a balsamic consistence and fragrance. They are generally composed, of expressed or ethereal oils, resins, and other solid bodies, which give them the consistence of butter. The basis, or body of them, is expressed oil of nutmeg, and frequently wax, butter, &c. They are usually tinged with cinnabar and saffron.

**BALSAM** See **MOLDAVICA** and **IMPATIENS**.

**BALSAM APPLE** (Male) See **MOMORDICA**.

**BALSAM OF CANADA** See **BALSAMUM CANADENSE**.

**BALSAM OF COPAIVA** See **BALSAMUM COPAIVÆ**.

**BALSAM** (Natural) A resin which has not yet assumed the concrete form, but still continues in a fluid state, is so called, as common turpentine, balsamum copaivæ, peruvianum, toluatum, &c.

**BALSAM** (Peruvian) See **BALSAMUM PERUVIANUM**.

**BALSAM OF TOLU** See **BALSAMUM TOLUTANUM**.

**BALSAMEA** The balm of Gilead fir. The tree formerly so called in the pharmacopœias, is the *pinus balsamea* of Linnæus. It affords the Canada balsam. See **BALSAMUM CANADENSE**.

**BALSAMICAL** **BALSAMICK** a Uncuous, mitigating, soft, mild (*Hale*).

**BALSAMICS** A term generally applied to substances of a smooth and oily consistence, which possess emollient, sweet, and generally aromatic qualities.

**BALSAMINE** (Female) See **IMPATIENS**.

**BALSAMITA** In botany, a genus of the class syngenesia, order polygamia æqualis. Receptacle naked, downless, calyx imbricate. Four species all natives of Italy and the Barbary coasts.

**BALSAMITA MAS** *Tanacetum hortense* *Costus hortorum* Costmary or alecost. The plant which bears this name in the pharmacopœias is the *tanacetum balsamita*, *folius ovatis*, *integris serratis* of Linnæus. A fragrant smelling herb, somewhat like that of mint, formerly esteemed as a corroborant, carminative, and emmenagogue.

**BALSAMITA FEMINA** See **AGERATUM**.

**BALSAMUM AMERICANUM** See **BALSAMUM PERUVIANUM**.

**BALSAMUM BRASILIENSE** See **BALSAMUM COPAIVÆ**.

**BALSAMUM CANADENSE** Canada balsam. One of the purest turpentine, procured from the *pinus balsamea* of Linnæus, and imported from Canada. For its properties, see **TURPENTINES**.

**BALSAMUM COPAIVÆ** Balsamum Briliense Balsamum copaibæ Balsamum de copaiba. A yellow resinous juice of a moderately agreeable smell, and a bitterish biting taste, that remains a long time in the mouth. It is obtained from the *copaifera officinalis* of Linnæus, class decandria, order monogynia, by making deep incisions near the base of its trunk. The juice flows so freely as to afford twelve pounds in about three hours. Balsam of copaiva, like most other balsams, is nearly allied to the turpentine, with which it is always mixed in the shops. It was formerly thought to be a very efficacious remedy. It determines very powerfully to the kidneys, and impregnates the urine with its qualities. It is given principally in gonorrhœas, phthisis pulmonalis, fluor albus, and in nephritic complaints.

**BALSAMUM GILEADENSE** Balsamum de Mecca Balsamum Meccanum Balsumum verum. This resinous juice, obtained by making incisions into the bark of the *amyrus gileadensis* of Linnæus (*amyrus foliis ternatis integerrimis, pedunculis unifloris lateralibus* class octandria, order monogynia), is of a light yellow colour, of a bitter, acrid, adstringent taste, and of a very strong smell, resembling that of lemons. The chief mark of its goodness is said to be founded on this, that when dropped on water, it spreads itself all over the surface, forming a thin pellicle, tough enough to be taken up upon the point of a pin, and, at the same time, impregnating the water with its smell and flavour. Its virtues are similar to those of the Canada and copaiva balsams. The fruit of this tree is termed *carpobalsamum* in the pharmacopœias, and the wood or branches, *xylobalsamum*. See **AMYRIS**.

**BALSAMUM DE MECCA** See **BALSAMUM GILEADENSE**.

**BALSAMUM INDICUM** See **BALSAMUM PERUVIANUM**.

**BALSAMUM MECCANUM** See **BALSAMUM GILEADENSE**.

**BALSAMUM MEXICANUM** See **BALSAMUM PERUVIANUM**.

**BALSAMUM PERUVIANUM** Balsamum Indicum. Balsamum Mexicanum Balsamum Americanum Balsam of Peru. The tree which produces this resinous fluid is described by the younger Linnæus by the name of *myroxylon Peruiferum* class decandria, order monogynia. Two species of this balsam are imported into this country, the common or black, and the white. The first, which is chiefly used, is about the consistence of a syrup, of a dark, opaque, reddish brown colour, inclining to black, and of an agreeable aromatic smell, and a very hot pungent taste. The white balsam, called also white storax, is brought over in gourd-shells, and is of a pale

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yellow colour, thick and tenacious, becoming by age solid and brittle. They are esteemed as warm nervine medicines, and are sometimes used by surgeons in certain conditions of wounds and ulcers.

**BALSAMUM PERUVIANUM ALBUM** See **BALSAMUM PERUVIANUM**

**BALSAMUM PERUVIANUM NIGRUM** See **BALSAMUM PERUVIANUM**

**BALSAMUM RACKASIRA** This balsam, which is inodorous when cold, but of a smell approaching to that of tolu balsam when heated, is brought from India in gourd shells. It is slightly bitter to the taste, and adheres to the teeth on chewing. It is supposed by some to be factitious. It is never prescribed in this country.

**BALSAMUM TOLUTANUM** Balsam of tolu. This juice, which is considered as a true balsam by modern chemists, is of a reddish, yellow, transparent colour, in consistence thick and tenacious, by age it becomes so hard and brittle, that it may be rubbed into a powder between the finger and thumb. Its smell is extremely fragrant, somewhat resembling that of citrons; its taste is warm and sweetish, on being chewed it adheres to the teeth. Thrown into the fire it immediately liquefies, takes flame, and disperses an agreeable odour. The tree which affords this balsam, from incisions of its bark, is the *tolutifera* balsamum of Linnaeus, which grows in South America, between Carthage and Honduras. Tolu balsam possesses corroborant, stomachic, and nervine qualities. It has been chiefly used as a pectoral, and is directed in the pharmacopoeias in the *symplicus tolutanus*, *tinctura tolutana*, and *symplicus balsamicus*.

**BALSAMUM VERUM** See **BALSAMUM GILGADENSE**

**BALSHAM** (Hugh de), or **DE BEDESALE**, or **BELESALE**, the tenth bishop of Ely, and founder of St. Peter's college, otherwise Peterhouse, in Cambridge, was in all probability born at Balsham in Cambridgeshire (from whence he took his surname), towards the beginning of the thirteenth century. He was at first a monk, and afterwards sub-prior of the Benedictine monastery at Ely. In 1247, November 13 he was chosen, by his convent, bishop of Ely, in the room of William de Kilkeny, deceased. But king Henry III. who had recommended his chancellor Henry de Wingham, being extremely angry at the disobedience of the monks, refused to confirm the election, and, moreover, he felled the woods, spoiled the ponds, and otherwise wrested the manors and estates belonging to the bishopric. He endeavoured at last to persuade the monks to proceed to a new election, alleging, that it was not fit so strong a place as Ely should be entrusted with a man that had scarcely ever been out of his cloister, and who was utterly unacquainted with political affairs. Balsham, finding he was not likely to succeed at home, went to Rome, in order to be confirmed by the pope, who, through the plenitude of his apostolical power, pretended

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to dispose of all the ecclesiastical preferments in Christendom. In the mean time, Boniface archbishop of Canterbury used his utmost interest at Rome to obstruct Hugh de Balsham's confirmation, though he could allege no one fault against him, and recommended Adam de Maris, a learned Minorite friar, as a fit person to be promoted to the bishopric; but all his endeavours proved unsuccessful. As to Wingham, having been recommended by the king without his own desire and knowledge, he did not stir in the least to get himself elected by the monks, but rather, out of an uncommon excess of modesty, declined the honour, alleging that the two others (Balsham and Maris) were more worthy of it, and more deserving than himself. This matter remained in suspense for above ten years and was at length determined in favour of Hugh de Balsham. For Wingham being promoted to the bishopric of London, upon Fulke de Basset's decease, the pope confirmed Hugh de Balsham's election on the 10th of March, 1257, and he was consecrated the 14th of October following. Being thus fixed in his see, he applied himself to works of charity, and particularly, in the year 1257, or 1259 according to some, put in execution what he had designed, if not begun, before, that is, he laid the foundation of St. Peter's college, the first college in the university of Cambridge. He built it without Trumpington gate, near the church of St. Peter (since demolished), from whence it took its name. He died at Dodington, June 16, 1286, and was buried in the cathedral church of Ely.

**BAL I AGI**, among the Turks, porters and hewers of wood in the court of the grand signior, who also mount on horseback when the emperor rides out.

**BALTHIEUS ORIONIS**, Orion's belt, in astronomy, three stars of the second magnitude, placed nearly in a right line in Orion.

**BALTIC SEA** (the *Mare Suevicum* of the Romans). A great gulf N. of Germany and Poland, from which run several other gulfs, particularly those of Bothnia, Finland, Livonia, and Dantzick. This sea neither ebbs nor flows, and a constant current always sets through the Sound into the Northern Ocean. Great quantities of yellow amber are found on some parts of its coast.

**BALTIMORA** In botany, a genus of the class syngenesia, order polygamia necessaria. Receptacle chaffy, downless, calyx cylindrical, many leaved, ray five-flowered. One species only, a native of Maryland, with channelled, tough angular stem and yellow flowers.

**BALTIMORE**, a town of Ireland, in the county of Cork, and province of Munster. It is seated on a promontory. Lat 51 24 N. Lon 9 14 W.

**BALTIMORE**, a county of Maryland, in America. Its chief town is of the same name, and is reckoned the fourth in size, in the United States. Its inhabitants amount to about 10,000. Lat 39 45 N. Lon 76 25 W.

## B A M

**BALUCLAVO**, or **JAMBOL**, a town on the W coast of Crim Tartary, in European Turkey Lat 44 50 N Lon 34 13 E

**BALLYARDS** *s* (from *ball*, and *yard*, or stick) A play at which a ball is driven by the end of a stick now corruptly called billiards (*Spenser*)

**BALYUR**, or **BALIUR**, a sea-port of Africa in the kingdom of Dancali, about fourteen hours journey west from Babel Mandel

**BAM**, **BEAM**, being initials in the name of a place, imply it to have been woody, from the Saxon beam (*Gibson*)

**BAMBA**, a province of the kingdom of Congo in Africa, situated between the rivers of Ambrisi and Lose, the last of which parts it from Pemba on the east, as the Ambrisi does from the province of Sogno on the north. Along the sea-coasts it extends itself northward to the river Lelunda, and on the south to that of Danda, which parts it from the kingdom of Angola

**BAMBARA**, a kingdom of Western Africa, bounded by the Moorish kingdom of Beeroo to the north, and Masinah, a Foulah state, south of Beeroo, by the districts of Gotto, Breedoo, and Marciana, and Nigritia or Soudan to the east, by Kong to the south, and by Ludamar and Kaarta to the west. According to Mr Park, this country is beautiful and highly cultivated, while the natives are very benevolent and hospitable

**BAMBERG**, a bishopric of Franconia, in Germany, having its capital of the same name, where a university was founded in 1583. Bamberg is 35 miles N of Nuremberg Lat 50 2 N Lon 11 7 E

**BAMBERG**, a town of Bohemia, on the frontiers of Moravia, 30 miles S of Glatz Lat 49 25 N Lon 16 50 E

**BAMBOO HABIT**, a Chinese invention, by which a person, who cannot swim, may easily keep himself above water. Four bamboos, two before and two behind their bodies, are placed horizontally, and project about twenty eight inches. They are crossed on each side by two others, and the whole properly secured, leaving a space for their body, it is put over their heads, and used secure in two minutes

To **BAMBOOZLE** *v a* To deceive, to impose upon a low word (*Arbutnot*)

**BAMBOOZLER** *s*. A cheat (*Arbutnot*)

**BAMBOROUGH**, a village in Northumberland, on the sea-coast, 14 miles N of Alnwick. It was once a borough, and gave name to a tract called Bamboroughshire. It has a castle, on a rock, inaccessible on all sides, except the south, which is said to have been built by Ida, king of the Northumbrians, about 570. This castle, with the estate, was purchased by Crew, bishop of Durham, and left to charitable uses. One of the trustees, Dr. Sharp, prebendary of Durham, made this castle his residence, reserving a part for the use of himself and family, and furnishing a part of the rest for the reception and accommodation of shipwrecked mariners and a granary was

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filled with corn to serve the poor in the dear seasons at a low price. A constant patrol was kept the whole extent of the manor (eight miles), to succour the distressed, and by a mode of firing a cannon from the castle, the very place of misfortune could be pointed out, and directions given to the neighbouring people to assist. By these means many lives of mariners have been saved, and, we trust, so benevolent a will as that of bishop Crew will never fail to produce beneficial consequences

**BAMBOUK**, a kingdom of Africa, in the country of Senegal. It is very populous, and, on the borders of the rivers, fertile, but in other parts sandy and barren. The most remarkable animals are white apes, white foxes, and the girata, an animal rather less than an elephant, but like a camel, and of great swiftness. There are mines of gold, silver, lead, tin and iron

**BAMBU CANE** See **ARUNDO**

**BAMBOO'SA** Bimboo In botany, a genus of the class hexandria, order monogynia. Scales three, covering the spikelets which are about five-flowered, calyxless, corol a two-valved glume, style bifid, seed one. Two species, both natives of the Indies 1 *b arundinacea* 2 *b verticillata*

**BAMF**, the capital of a shire of the same name in Scotland. It is seated at the mouth of the river Dovern, near which it has a harbour and some trade. It is 110 miles N of Edinburgh Lat 57 35 N Lon 2 15 W. The county contains 35,800 inhabitants

**BAMIYAN**, a city of Asia, situated in the province of Zablestan, ten days journey from Balk, and eight from Gazna

**BAMPTON**, a town in Oxfordshire, with a market on Monday Lat 51 46 N Lon 1 25 W

**BAMPTON**, a town in Devonshire, with a market on Saturday, and a chalybeate spring Lat 51 2 Lon 1 11 W

**BAN** *v* (*lan*, Teutonic) 1 Publick notice given of any thing (*Cowell*) 2 A curse, excommunication (*Raleigh*) 3 Interdiction (*Milton*)

To **BAN** *v a* (*lannen*, Dutch) To curse, to execrate (*Knolles*)

**BAN**, a smooth, fine muslin from the East Indies

**BANANA**, in botany. See **MUSA**

**BANARA** In botany, a genus of the class icosandria, order monogynia. (alyx inferior, four-cleft, petals four; berry one celled, many-seeded. One species only, a native of Cayenne. Size that of a shrub

**BANARES**, or **BNARES**, a handsome town of Asia, in the dominions of the Great Mogul, greatly celebrated for its sanctity, and being the university of the Indian Brahmins. It is seated on the north side of the river Ganges, in lat. 26 20 N lon 82 30 E. The observatory at this place is a great curiosity. An interesting account of it is given by Sir Robert Barker, in vol 67, Phil. Trans.

**BANBURY**, a town of Oxfordshire, having a market on Thursdays. It sends one

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member to Parliament Lat 52 4 N Lon 1 11 W

**BANC**, or **BENCA**, in law, denotes a tribunal, or judgment-seat hence king's banc is the same with the court of king's bench, and common banc with that of common pleas

**BANCA**, an island between Sumatra and Borneo, in the East Indies, with a town and streight of the same name Lat 2 35 S Lon 106 50 E

**BANCALIS**, a sea-port town on the eastern coast of Sumatra, where the Dutch have a settlement Lat 1 15 N Lon 100 7 E

**BANCIJUS**, or the privilege of having a bench, was anciently only allowed to the king's judges, qui summam administrant justitiam Inferior courts, as courts baron, hundred courts, &c were not allowed that prerogative, and even at this day the hundred court at Freibridge in Norfolk is held under an oak at Gly-wood, and that of Woolfry in Herefordshire, under an oak near Ashton in that county, called Hundred Oak

**BANCROFT** (Richard), archbishop of Canterbury, in the reign of king James I was born at Farnworth, in Lancashire, in September 1544 He was made chaplain to Dr Cox, bishop of Ely, who, in 1575, gave him the rectory of Feversham in Cambridgeshire The year following, he was licensed one of the university preachers, and in 1580 was admitted bachelor of divinity September the 14th, 1584, he was instituted to the rectory of St Andrew, Holborn, at the presentation of the executors of Henry earl of Southampton In 1581 he commenced doctor in divinity, and the same year was made treasurer of St Paul's cathedral, in London The year following he became rector of Cottingham in Northamptonshire, at the presentation of sir Christopher Hatton, lord chancellor, whose chaplain he then was February the 25th, 1589, he was made a prebendary of St Paul's, in 1592, advanced to the same dignity in the collegiate church of Westminster, and, in 1594, promoted to a stall in the cathedral of Canterbury Not long before, he had distinguished his zeal for the church of England by a sermon, preached against the puritans at St Paul's Cross In 1597, Dr Bancroft, being then chaplain to the archbishop of Canterbury, Whitgift, was advanced to the see of London, in the room of Dr Richard Fletcher, and consecrated at Lambeth the 8th of May—Irom this time he had, in effect, the archiepiscopal power, for the archbishop, being declined in years, and unfit for business, committed the sole management of ecclesiastical affairs to bishop Bancroft Soon after his being made bishop he expended 1000 marks in the repair of his house in London In the year 1600, he, with others, was sent by queen Elizabeth to Embden to put an end to a difference between the English and Danes but the embassy had no effect This prelate interposed in the disputes between the secular priests and the Jesuits, and furnished some of the former with materials to write against their adversa-

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**ries** In the beginning of king James's reign, bishop Bancroft took an active part in the celebrated conference between the bishops and the presbyterian ministers and when the king required satisfaction in the three points of confirmation, absolution, and private baptism, he undertook to explain and vindicate these branches of ecclesiastical discipline, as they were exercised in the church of England In the prosecution of this conference, and with a view to its speedy termination by an act of authority, he moved the king that an ancient canon that "Schismatics are not to be heard against bishops, should be revived This and other unjust proposals were rejected by the king The same year, 1603, he was appointed one of the commissioners for regulating the affairs of the church and for perusing and suppressing books, printed in England, or brought into the realm without public authority A convocation being summoned to meet March 20, 1603 4, and archbishop Whitgift dying in the mean time, bishop Bancroft was, by the king's writ, appointed president of that assembly October 19th, 1604, he was nominated to succeed the archbishop in that high dignity, to which he was elected by the dean and chapter, November 17, and confirmed in Lambeth chapel, December 10 In 1608 he was declared chancellor of the university of Oxford, in the room of the earl of Dorset deceased In 1610, this archbishop offered to the parliament a project for the better providing a maintenance for the clergy, but without success One of our historians pretends that archbishop Bancroft set on foot the building a college near Chelsea for the reception of students, who should answer all popish and other controversial writings against the church of England This prelate died Nov 2, 1610, of the stone, in his palace of Lambeth

**BAND** *s* (*bunde*, Dutch) 1 A tie, a bandage (*Shaks*) 2 A chain by which any animal is kept in restraint (*Dryden*) 3 Any means of union or connexion (*Shaks*) 4 Any thing bound round another (*Bacon*) 5 A company of persons joined together (*Tat*)

**BAND**, in architecture, a general name for any flat low member, or moulding, that is broad, but not very deep

**BANDS OF A SADDLE** in horsemanship, two flat pieces of iron, about three fingers broad, nailed upon the bows of the saddle, one on each side, to retain them in the situation that constitutes the form of the saddle Besides these two larger bands, the fore bow has a small one called the wither band, and a crescent to support the wither arch The hinder bow has likewise a small band to render it stronger

**To BAND** *v a* (from the noun) 1 To unite together into one body or troop 2 To bind over with a band (*Dryden*)

**BANDA ISLES**, a group of islands in the Eastern sea, lying to the east of the Celebes, they are so called from *Banda*, the principal of them The largest of them is not above twenty miles in length They are supposed to contain about 5000 inhabitants, though form-



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ely they were much more numerous Their chief produce is nutmegs, of which they are competent to supply the want to the rest of the world The names of the islands are Banda, or Lantor, Gonapi, or Gounong-Api, Ay, or Pulo-Ay, Rhun, or Pulo-Rhun, and Resingyn Banda lies in Lat 4 50 S Lon 128 5 E

**BANDAGE** *s* (*bandage*, Fr) Something bound over another (*Addison*)

**BANDAGE**, in surgery See **SURGERY**

**BANDBOX** *s* (from *band* and *box*) A slight box used for bands, and other things of small weight (*Addison*)

**BANDELET** *s* (*bandelet*, Fr) In architecture, any little band, flat moulding, or fillet

**BANDIT** } *s* in the plural *banditti*

**BANDITTO** } (*bandito*, Italian) In a general sense, a man outlawed (*Milt Shaks*)

**BANDITTI** is also a denomination given to highwaymen or robbers who infest the roads in troops, especially in Italy, France, and Sicily Mr Brydone, in his tour through Sicily, informs us, that in the eastern part, called Val Demoni, from the devils that are supposed to inhabit Mount Ætna, it has ever been found altogether impracticable to extirpate the banditti, there being numberless caverns and subterraneous passages round that mountain, where no troops could possibly pursue them besides, they are known to be perfectly determined and resolute, never failing to take a dreadful revenge on all who have offended them Hence the prince of Villa Franca has considered it, not only as the safest, but likewise as the wisest and most political scheme, to become their declared patron and protector and such of them as think proper to leave their mountains and forests, though perhaps only for a time, are sure to meet with good encouragement and a certain protection in his service, where they enjoy the most unbounded confidence, which in no instance they have ever yet been found to make an improper or a dishonest use of They are clothed in the prince's livery, yellow and green with silver lace, and wear likewise a badge of their honourable order, which entitles them to universal fear and respect from the people

**BANDOLEERS** *s* (*bandouliers*, French) Small wooden cases covered with leather, each of them containing powder that is a sufficient charge for a musket

**BANDON**, a river of Ireland, which empties itself into the harbour of Kinsale, in the county of Cork

**BANDONBRIDGE**, a town of Ireland, in the county of Cork, on the river Bandon It is a borough town, and sends two members to parliament eleven miles SSW Cork, and eight NW Kinsale

**BANDORA**, the principal village of the island of Salset, in the East Indies It is separated from the island of Bombay by a narrow channel Lat 19.0 N Lon 72 40 E

**BANDORA**, an ancient musical stringed instrument, resembling a lute

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**BANDROL** *s* (*banderol*, Fr) A little flag or streamer

**BANDY** *s* (from *bander*, Fr) A club turned round at bottom, for striking a ball

**To BANDY** *v a* 1 To beat to and fro, or from one to another (*Blackmore*) 2 To give and take reciprocally (*Shaks*) 3 To agitate, to toss about (*Locke*)

**To BANDY** *v n* To contend (*Hudibras*)

**BADYLEG** *s* (from *bander*, French) A crooked leg (*Swift*)

**BANDYLEG-GED** *a* (from *bandyleg*) Having crooked legs (*Collier*)

**BANF** *s* (*bana*, Sax a murderer) 1 Poison (*Addison*) 2 Mischief, ruin (*Hooker*)

**To BANE** *v a* To poison (*Shakspeare*)

**BANE BERRY**, in botany See **ACTÆA**

**BANEFUL** *a* (from *bane* and *full*) 1. Poisonous (*Pope*) 2 Destructive (*B Jonson*)

**BANEFULNESS** *s* (from *baneful*) Poisonousness, destructiveness

**BANEWORT** *s* Deadly nightshade

**To BANG** *v a* (*vengolen*, Dutch) 1 To beat, to thump (*Howel*) 2 To handle roughly (*Shakspeare*)

**BANG** *s* A blow, a thump (*Hudibras*)

**To BANGLF** *v a* To waste by little and little (*Duty of Man*)

**BANGLE-EARS**, in the manage, an imperfection in horses, which may be remedied in the following manner place the ears in the situation in which you would have them stand, and then with two little boards three fingers breadth, or thereabouts, with two long strings fastened to them, bind the ears so fast in the places where they are fixed that they cannot stir Then behind the head, and at the roots of the ears, you will perceive a large quantity of wrinkled skin, which you must take up with your finger and thumb, and at the same time clip away with a sharp pair of scissors all the empty part close by the head Then with a needle and silk stitch the two outsides of the skin together, and heal it up as a common cut or wound when this is done, let the splints or pieces of boards be removed, and in a little time the ears will retain the position they were fixed in at the time of performing the operation

**BANGOR**, an episcopal city of Carnarvonshire, in North Wales It was formerly very large, and was defended by a strong castle, which has long been demolished On account of its extent and populousness it received the appellation of Bangor Vaur, i e Bangor the Great This bishopric is valued in the king's books at 131l 16s 3d It has a market on Wednesday, and is 251 miles NW by W of London Lat 53 12 N Lon 4 12 W

**BANGOR**, a borough town of the county of Down, Ireland Lat 54.40 N Lon 5 42 W

**BANGUE**, an Indian name for a plant not yet classified, whose stalks resemble those of hemp Its seeds and leaves are heating, and strangely affect the imagination Aphrodisiac qualities are also attributed to them.

**BANIANS**, a religious sect in the empire

of the Mogul, who believe a metempsychosis; and will therefore eat no living creature, nor kill even noxious animals, but endeavour to release them when in the hands of others. The name of Banian is used with some diversity, which has occasioned much confusion, and many mistakes. Sometimes it is taken in a less proper sense, and extended to all the idolaters of India, as contradistinguished from the Mahometans in which sense, Banians include the Bramin and other casts. Banians, in a more proper sense, are restrained to a peculiar cast, or tribe, of Indians, whose office or profession is trade and merchandize, in which sense, Banians stand contradistinguished from Bramins, Cuttery, and Wyse, the three other casts into which the Indians are divided. The four casts are absolutely separate as to occupation, relation, marriage, &c though all of the same religion, which is more properly denominated the religion of the Bramins, who make the ecclesiastical tribe, than of the Banians, who make the mercantile. The proper Banians are called, in the Shaster, or book of their law, by the name of Shuddery, under which are comprehended all who live after the manner of merchants, or that deal and transact for others, as brokers, exclusive of the mechanics, or artificers, who make another cast, called Wyse.

The Banians are the great factors, by whom most of the trade of India is managed, being in this respect equal to the Jews and Armenians, and not inferior to either in skill and experience, in whatever relates to commerce. Nothing is bought but by their mediation. They seem to claim a kind of *jus divinum* to the administration of the traffic of the nation, grounded on their sacred books, as the Bramins do to that of religion. They are dispersed for this purpose through all parts of Asia, and abound in Persia, particularly at Ispahan and Gombroon, where many of them are extremely rich, yet not above acting as brokers, where a penny is to be got.

**BANIAN DAYS**, a cant term among sailors, to signify those days in which they have no fresh meat.

**BANIAN TREE** See **FICUS**

**BANJAR**, a river of the island of Borneo, in the East Indies, in the mouth of which (twice as broad as the Thames at Gravesend) is a floating town, where the English East India Company have a factory.

**BANILLA**, in botany See **VANILLA** and **VANILLOE**

**To BANISH**, *v a* (*banir*, French.) 1 To condemn to leave his own country (*Shaks*) 2 To drive away (*Tillotson*)

**BANISHER** *s* (from *banish*) He that forces another from his own country (*Shaks*)

**BANISHMENT** *s*. (*banissement*, Fr.) 1 The act of banishing another 2 The state of being banished or exile (*Dryden*)

**BANISHMENT**, exile, among us, is of two kinds: the one voluntary, and upon oath, the other by compulsion, for some offence against the law. The former, properly called *abjuration*, is now

ceased, the latter is chiefly enjoined by judgment of parliament. Yet outlawing and transportation may also be considered as a species of exile. By Magna Charta, none shall be outlawed or banished his country but by lawful judgment of his peers, or according to the law of the land 9 Hen. III. c. 39. And by the common law, no person shall be banished but by authority of parliament, or in case of abjuration for felony, &c. But this is taken away by statute, 3 inst. 115 stat. 21 Jac. I. c. 28.

**BANISTERIA**, in botany, a genus of the class decandria, order trigynia. Calyx five-parted, with two melliferous pores at the base of each division, on the outside, petals roundish, with claws, filaments cohering at the base, capsules three, one-seeded, simply winged at the top. Twenty-three species, almost all natives of the West Indies or America.

**BANK**, in commerce, is a denomination given to certain societies, or communities, who take on them the charge of the money of private persons, to keep it secure, and pay whenever demanded. The word *bank*, in this sense, comes from the Italian *banca*, formed of the word *banco*, a bench, whereon the ancient money-changers sat in the public markets, or, as others think, a table whereon they told their money, for the term *banco* signifies a table, as well as a bench, as among the Greeks, the word *τραπέζα* signified a bench, as well as a table; whence the word *τραπέζιτης* for a bencher.

It cannot be doubted that the beginning of traffic was by exchanging one commodity for another, as men could best suit each others occasions. But the necessities of men being so various and different, in respect to the quantity and quality of requisites, money was instituted as the most convenient medium for commerce, whereby people might procure whatsoever they stood in need of in quantities according to their exigencies. Yet this way of payment is attended with many inconveniences, as the trouble in counting the money, hazard in securing it from the attempts of robbers, and loss from trusting it with unfaithful servants for the prevention of all which, cities of large commerce have very naturally introduced the use of banks. A bank then may be properly defined a common repository, where many persons agree to keep their cash, to be always ready at their call or direction. The first institution of banks was in Italy, where the Lombard Jews kept benches in the market-places for the exchange of money and bills; and *banco* being the Italian name for benches, banks took their title from this word.

There are two principal kinds of banks, either public, consisting of a society of wealthy men, who, being duly incorporated according to law, agree to deposit a considerable fund, or joint stock, to be employed for their use, by lending money upon good security, buying and selling, bullion, discounting bills of exchange, &c.; or private, which are established by individuals, or companies, who deal in the

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same way as the former, upon their own stock and credit.

The bank of Venice was established about the year 1187, the bank of Geneva in 1345, the bank of Amsterdam in 1609, the bank of Flakburgh in 1619, the bank of Rotterdam in 1635, the bank of England in 1694, the bank of Scotland in 1695, the bank of France in 1718.

**BANK OF ENGLAND** was projected by Mr W Paterson, a merchant, who in conjunction with others arranged the establishment, for which with some difficulty they obtained the sanction of parliament. The charter was executed July 27, 1694, and was granted for the term of twelve years, the corporation being then determinable on a year's notice. The original capital subscribed was 1,200,000*l.* which they lent to government at 8 per cent interest, with an allowance of 4000*l.* per annum for their expenses of management.

In less than two years from its establishment the company was involved in much difficulty from the bad state of the silver coin, and the great discount to which all public securities had fallen the impossibility of getting a sufficient supply of cash during the re-coinage reduced them to the necessity of paying their notes by small instalments, and of issuing bonds, bearing interest, in exchange for their cash notes. These difficulties, however, were overcome by prudent management, and the responsibility and reputation of the bank became fully established. The term of the charter was, in 1706, extended to five years beyond the original period, in consideration of the company having undertaken to circulate for government exchequer bills to the amount of 1,500,000*l.* and it has since been further extended at different times, viz

In 1700 to 1st of August 1738	
1713	1742
1742	1764
1763	1786
1781	1812
1800	1833

On all these occasions the company have either paid a considerable sum, or advanced a greater amount by way of loan to government, as consideration for the renewal of their exclusive privileges, and for the advantages they derive from acting as the agents for government in all money transactions of any importance. Their chief privilege consists in the prohibition of all other companies or partnerships of more than six persons from issuing bills or notes payable on demand, or for any time less than six months.

The total permanent debt due from government to the bank is 11,280,000*l.* bearing 3 per cent interest; but the capital stock of the company is 11,280,000*l.* on which they pay a dividend of 10 per cent per annum to the shareholders.

The notes of the bank of England are the most common of money in all the commercial parts of London and its vicinity, and

from the vast magnitude of the payments in which they are employed, the total amount in circulation, which till within a few years was never made public, was generally thought to be much greater than it has since appeared to have been. The total amount of bank notes in circulation on the 25th of February, 1787, was 8,688,870*l.* which on the 25th of February, 1793, had increased to 11,451,180*l.* Soon after this period the temporary annual advances which the bank had long been accustomed to make to government were increased; while an advance in the price of gold, in consequence of the great exportation of coin and bullion to Germany and Ireland, greatly reduced the quantity in the hands of the bank, and consequently rendered it impracticable to maintain the same amount of notes in circulation. An alarm of invasion in the beginning of the year 1797 greatly increased the demands on the bank for cash, and it was deemed necessary for the government to interfere and authorise a suspension of payment in cash for bank notes, for a limited period\*. The continuance of the suspension was at first renewed annually, and afterwards till the return of peace. In order to supply a substitute for coin for making small payments, the bank issued notes of 2*l.* and 1*l.* each, and as the demand for notes of this description has increased, the total amount of bank notes in circulation has become considerably greater than previous to the suspension of issuing cash, viz

On the 1st of Feb 1805,	£18,397,880
1806,	17,293,570
1807,	16,621,390

From the reports of the secret committee appointed in 1797 to investigate the affairs of the bank, it appeared that on the 25th of February, in that year, there was a balance of 3,826,903*l.* and on the 11th of November a balance of 3,839,550*l.* in favour of the company, their profits since must have been greater than while they were obliged to maintain a large stock of cash to answer their notes, which has enabled them to make several occasional dividends to their proprietors, and at Lady-day, 1807, to raise their usual dividend from 7 per cent which it had been for the last nineteen years, to 10 per cent.

The profits of the company arise from the interest received from government on the permanent debt, and on their annual advances on exchequer bills and treasury bills of exchange, from their allowance for receiving the contributions to loans, and for paying the dividends on the public funds; from dealing in bullion,

\* By the report of the committee of lords and commons, it appears that the court of directors, between the 1st of January, 1795, and the 24th of February, 1797, had made nine-and-twenty representations to the chancellor of the exchequer, stating the inconvenience which the bank suffered, and the evil consequences which were likely to ensue from the large amount of the advances to government.

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and discounting mercantile bills of exchange, and other sources of less importance.

The concern is under the management of a governor, deputy governor, and twenty-four directors, who are elected annually. 500l bank stock entitles the proprietor to a vote at the general courts, and no proprietor is entitled to more than one vote for any sum whatever (*British Encyclo*.)

**BANK OF SCOTLAND** was established under the superintendence of Mr W Paterson, from whom the plan of the bank of England originated. It was erected by an act of the parliament of Scotland in 1695, and although its capital stock was only 1,200,000l Scots, or 100,000l sterling, it was soon found very beneficial to the commerce of North Britain. In 1774 they were authorised to increase their capital 1,200,000l Scots, or 100,000l sterling, and in 1784 another addition was made of the same amount. By an act passed in 1792, they were empowered to double the existing capital, which thus became equal to 600,000l sterling, and in 1794 a further addition was made equal to 400,000l sterling, the total capital thus became 12,000,000l Scots, or 1,000,000l sterling. The company is under the management of a governor, a deputy governor, twelve ordinary directors, and twelve extraordinary directors (*British Encyclo*.)

**BANK ROYAL OF SCOTLAND** was established by charter in 1727, with a capital of 151,000l sterling. The public revenues of Scotland are paid into this bank, and it is under the management of a governor, deputy governor, and sixteen directors.

**BANK OF IRELAND** was established in the year 1781. The original capital was only 600,000l and the company's privileges were determinable on twelve month's notice after the 1st of January, 1794. Previous to this period the capital was increased to 1,000,000l and the term extended to the 1st of January, 1816, and by a subsequent act they were empowered to augment their capital to 1,500,000l. In the original act by which this bank was established, it was directed that they should not borrow or give security by bill, bond, note, covenant, or agreement, under their common seal or otherwise, for any sum exceeding their capital, and a clause to a similar purport, though not in the same precise words, was included in the subsequent acts. Since the suspension of payment in cash, however, the total amount of the notes of the bank of Ireland in circulation has been greatly increased, so that on the 1st of January, 1797, they amounted only to 621,917l 6s 4d. including bank post bills, whereas on the 1st of February, 1806, the amount of their notes of 5l value and upwards was 1,076,118l 11s 2½d., and of some under 5l value 511,454l 10s 9d making together 2,487,572l 11s 11½d.

The bank receives interest at 5 per cent. from the government, on their permanent and temporary loans, and an allowance for management of such part of the public debt as has

been made transferable at the bank of Ireland (*British Encyclo*.)

**BANK OF AMERICA** was established by authority of Congress at Philadelphia, in the year 1791. The act of incorporation passed February 25th in that year. Its capital, or joint stock, amounts to ten millions of dollars, at 4s 6d, or 2,250,000l sterling. It is divided into 25,000 shares of four hundred dollars, or 90l sterling each share, certificates for which are issued by order and under the seal of the president, directors, and company of the said bank which certificates entitle the holders of them to such dividends as shall be declared half-yearly, by the said president and directors, on the first day of January, and the first day of July, in each year. The above capital consists of six millions of the six per cent. fund, which has been subscribed into it, and four millions of dollars in specie. By a resolution of the president and directors of this bank, which passed on the first day of February, 1793, it was determined that the dividends upon this stock might be received in London, or Amsterdam, without deduction, on the proprietors signing a requisition for that purpose, forms of which may be seen and had at the office of Messrs Robson and Gill, brokers for the purchase and sale of American funds, No 25, 'Change-alley, and No 2, Castle-alley, Royal Exchange.

**BANK (Million)**, derives its name from king William's million lottery in the year 1694; the proprietors agreed in partnership to purchase tickets in this lottery. They afterwards purchased many reversions of the 14 per cent. annuities, and admitted many proprietors of annuities to purchase their joint stock, which amounted, and still amounts, to 500,000l. They are a partnership by deed enrolled in chancery, in the year 1721. They divided 5 per cent till Lady-day, 1728, when they reduced their annual dividend to 4 per cent and it was again raised to 5 per cent, which is still continued.

**PRIVATE BANKS** have within these thirty years been formed in almost every considerable town in Great Britain, their purchases and payments of all kinds are made by notes, and thus the country business is in a great degree carried on by paper currency. It is almost generally believed, that the community at large has derived considerable benefit from this artificial method of increasing the circulating medium: a proposition, the truth or fallacy of which it would not be easy to demonstrate. Some persons, however, are of opinion, on the contrary, that the late multiplication of banking companies, in all parts of the united kingdom, is a measure fraught with evil; but most commercial men say, that instead of diminishing it increases the security of the public, it obliges all of them to be more circumstantial in their conduct, and, by not extending their currency beyond its due proportion to their cash, to guard themselves against those ruinous runs which the rivalship of so many companies

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ture is always ready to bring upon them. It restrains the circulation of each particular company within a narrower circle, and reduces their circulating notes to a smaller number. By dividing the whole circulation into a greater number of parts, the failure of any one company, an accident which, in the course of things, must sometimes happen, becomes of less consequence to the public. This free competition too obliges all bankers to be more liberal in their dealings with their customers, lest their rivals should carry them away. In general, if any branch of trade, or any division of labour, be advantageous to the public, the freer and more general the competition that prevails the better.

There is another kind of banks, instituted wholly upon the public account, and called *banks of deposit*; their nature is not generally understood, but their object is to reform the currency which may at any time be clipped, or otherwise reduced below its standard value. Such were the banks of Venice, Genoa, Amsterdam, Hamburgh, &c. when originally established, the last in particular being always obliged to pay in good money, according to the standard of the state. As the cash of such banks was more valuable than the common currency of the country, it necessarily bore an *agio*, or an additional per centage, in proportion as the currency was supposed to be more or less depreciated. Thus the *agio* of the bank of Hamburgh, which is said to vary from fourteen to twenty per cent, constitutes the supposed difference between the standard money of the state, and the clipped, worn, and debased currency poured in from the neighbouring countries.

The reader may advantageously consult Thomson, on the Nature of Paper Credit, by H. Thomson, esq. M.P.

**BANK**, in natural history, denotes an elevation of the ground, or bottom of the sea, so as sometimes to surmount the surface of the water, or, at least, to leave the water so shallow, as usually not to allow a vessel to remain afloat over it. In this sense, bank amounts to much the same with flat, shoal, &c. There are banks of sand, and others of stone, called also shelves or rocks. In the North sea, they also speak of banks of ice, which are large pieces of that substance floating about. The bank absolutely so called denotes the great bank of Newfoundland, the scene of the cod fishery.

**Banks** are usually distinguished by a buoy, spar, or the like. On charts, sand-banks are usually marked by little dots, and banks of stone by crosses. The colours of the buoys are also varied accordingly, sand-banks being the light-coloured buoys, and rocks by orange ones, as the Elbe, &c. In the sea and inundations, are banks, care is therefore taken to mark them from time to time, to show the extent. As every know-  
 bank is a danger, and the depth  
 the water around it  
 is matter of conse-

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**BANK** also denotes an elevation of earth, stones, or other materials, in form of a wall stored on both sides, to stop the waters, and prevent inundations. It likewise denotes a seat, or bench, of rowers.

**To BANK**, *v. a.* (from the noun.) 1 To enclose with banks. 2 To lay money in the hands of a banker.

**BANKAFALET**, a game at cards, a pack of which being cut into as many heaps as there are players, every man lays as much money on his own card as he pleases; and the dealer wins or loses as many as his card is superior or inferior to those of the other gamesters. The best card is the ace of diamonds, the next to it the ace of hearts, then the ace of clubs, and, lastly, the ace of spades, and so, of the rest of these suits in order, according to their degree. The cheat lies in securing an ace, or any other sure winning card, which are somehow marked, that the sharper may know them.

**BANK-BILL** *s.* (from *bank* and *bill*) A note for money laid up in a bank, at the sight of which the money is paid (*Swift*).

**BANKER** *s.* (from *bank*) One that trafficks in money. A list of the bankers in London is given annually in Kearsley Gentleman's Pocket Ledger, Johnson's Pocket Journal, and other similar publications.

**BANKER**, in bricklaying, a piece of timber on which bricks are cut.

**BANKING**, the making of banks to oppose the force of the sea, rivers, or the like, and secure the land from being overflowed or wasted. With respect to the water which is to be kept out, this is called banking, with respect to the land, which is hereby to be defended, embanking.

**BANKING** is also applied to the keeping a bank, or the employment of a banker. Banking, in this sense, signifies the trading in money, or remitting it from place to place by means of bills of exchange. Thus answers to what the French call *faire la banque*.

**BANKRUPT**, a dealer, who having gotten other men's goods, or money, in his hands, absconds to defraud his creditors, or being so reduced and involved that he can conduct his business no longer, is desirous of being legally discharged from farther demands and trouble. The word is formed of the ancient Latin *ban-cus*, a bench, or table, and *ruptus*, broken.

The present system of bankrupt laws is calculated for the benefit of commerce, and founded on the principles of humanity and justice. Hence they confer some privileges not only on the creditors, but also on the bankrupt or debtor himself, for, by taking into consideration the sudden and unavoidable accidents to which a person engaged in trade is liable, they not only grant personal liberty, but likewise pecuniary assistance, to men in this unfortunate situation; on condition that they surrender their whole estate, to be divided among their creditors. The benefit of the bankrupt laws, however, are allowed to none but actual traders, as merchants in general, the only persons



subject to accidental losses, and to an inability of discharging their debts without any fault of their own. But, when other individuals contract debts, the law renders them subject to the consequences of their own indiscretion.

In the last edition of Jacob's Law Dictionary there is a table stating who may, or who may not, be bankrupts, which we copy, referring to that work for the authorities and other particulars. Alehouse-keepers may not. Alum-manufacturers, not. Artificers, labourers, &c. not. Bankers, may. Bakers, brewers, brokers, brick-makers, butchers, and carpenters, may. Clergymen trading, clothiers, and coal-dealers, may. Companies, or corporations, proprietors of shares in, generally, not; except, perhaps, in the stationers' company. Contractors, public, and such other public officers, not. Drovers of cattle, not. Dyers, and factors, may. Farmer, not, but as a potatoe-merchant he may. Funds public, dealers in, not. Goldsmith, may. Graziers, not. Inn-keepers, not. Iron manufacturers, may. Labourers, and land-jobbers, not. Members of parliament, millers, milliners, sailors, pawnbrokers, and plumbers, may. Receiver-general of taxes, not. Salesmen, and scribes, may. Ship-owner, not, freighter, may. Shoemakers, and smugglers, may. Stock-jobbers, not. Tanners, may. Taylors, working, not. Victuallers, not. Vintners, being wine-merchants, may.

By the statutes of this country, a man makes himself a bankrupt in consequence of the following acts — 1. By departing from the realm, with intent to defraud his creditors, 2. By leaving his house with intent to secrete himself for the same purpose, 3. Remaining in his house so as not to be accessible to his creditors, 4. Procuring or suffering himself willingly to be arrested, outlawed, or imprisoned, without a just and lawful reason, 5. Causing his money or effects to be sequestered by any legal process, 6. Making any fraudulent conveyance to a friend, which is an act of the same suspicious nature as the last, 7. Procuring any protection to screen his person from arrests, though not entitled to that privilege by an act of parliament, 8. Endeavouring, by any petition to the king, or by a bill against any creditors, to compel them to take less than their just debts, or to procrastinate the time of payment, 9. Lying in prison for more than two months upon arrest, or other detention for debt, without finding bail, 10. Escaping from prison after an arrest for a just debt of one hundred pounds and upwards, 11. Neglecting to make satisfaction for any just debt to the amount of one hundred pounds, within two months after service of legal process for such debt, upon any trader enjoying the privilege of parliament.

Sir John Holt maintained, that a man's removing his goods privately, to prevent their being seized in execution, was no act of bankruptcy; as the statutes mention only fraudulent gifts to third persons, and causing them to be seized by sham-process, in order to defraud creditors. It has also been expressly deter-

mined, that a banker's stopping or refusing payment is not an act of bankruptcy; because there may be good reasons for such conduct, as a suspicion of forgery, &c. If, in consequence of such refusal, he is arrested, and put in bail, it is still no act of bankruptcy, but, if he goes to prison, and remains there two months, then, and not before, he becomes a bankrupt.

The consequences resulting from the unfortunate situation of a bankrupt, will be concisely stated under the article *COMMISSION OF BANKRUPTCY*.

*To BANKRUPTE* *v. a.* To break; to disable one from satisfying his creditors (*Hamm.*)

*BANKRUPTCY* *s.* (*from bankrupt*). 1. The state of a man broken, or bankrupt. 2. The act of declaring one's self bankrupt.

*BANK'S ISLAND*, an island in the Southern Pacific Ocean, the surface of which appears elevated, irregular, and broken: it is about twenty-four leagues in circumference, and inhabited. Lon 286 30 W Greenwich. Lat 43 32 S.

*BANK'S ISLAND*, an island in the North Pacific Ocean, near the west coast of North America about sixty miles long, and five broad. Lon 129 45 to 130 10 W Greenwich. Lat 53 30 N.

*BANKSIA*, in botany, a genus of the class tetrandria, order monogynia. Receptacle common, elongated, scaly, corol four-petalled, stamens inserted on the border; capsule one or two-valved, two-seeded, with a moveable partition between the seeds, seeds winged. The name given in honour of sir Joseph Banks, bart. Nine species some with a two-celled capsule and aggregate flowers, others with a one-celled capsule and solitary flowers. They are all natives of New Holland.

*BANN*, or *BAN*, *BANNUM*, or *BANNUM*, in the feudal law, a solemn proclamation, or publication of anything. The origin of the word is uncertain, some deduce it from the British *ban*, clamour, noise, others from the Saxon *pan*, a thing spread, whence *ban*, and *band*, used for a flag.

Bracton mentions *bannus regis*, for a proclamation of silence anciently made by the court, before the encounter of the champions in a combat.

*BANN* is also used for a solemn convocation of the nobility of a province, to attend the king in his army, conformably to their several tenures.

*BANN* also denotes a pecuniary mulct, or penalty, laid on a delinquent for offending against a *bann*.

*BANNS OF MARRIAGE* are certain solemn notices of matrimonial contracts made in the parish church before the marriage, that if there be any objections to either party as to prior engagements, &c. there may be an opportunity of making them. The publication of *banns* (popularly called *asking in the church*) was intended as an expedient to prevent clandestine marriages, but a licence or dispensation is now easily procured, so that their use is defeated.

The use of matrimonial *banns* is said to have

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been first introduced into the Gallican church, though something like it obtained even in the primitive times, and it is this that Tertullian is supposed to mean by *truncatae promulgatio*. The council of Lateran first extended, and made the usage general. By the ordinance of 1213, no person could validly contract marriage, without a preceding proclamation of three banns; nor could this in any case be dispensed with, except for the two last. But the French, even before their revolution, abated of this severity, and minors only were under an absolute necessity of submitting to the formality of banns. For minors, or those of age, after publication of the first banns, the two latter were easily bought off.

**BANN** is also used to denote proscription or banishment for a crime proved, because anciently published by sound of trumpet, or, as Vossius thinks, because those who did not appear at the abovementioned summons were punished by proscription. Hence, *to put a prince under the ban of the empire*, is to declare him divested of all his dignities.

**BANN**, in military affairs, a proclamation made in the army by beat of drum, sound of trumpet, &c. requiring the strict observance of discipline, either for the declaring a new officer, or punishing an offender.

**BANNALISMOLA**, or **BANNAL-MILL**, a kind of feudal service, whereby the tenants of a certain district are obliged to carry their corn to be ground at a certain mill, and to be baked at a certain oven, for the benefit of the lord.

**BANNER** denotes either a square flag, or the principal standard belonging to a prince. We find a multiplicity of opinions concerning the etymology of the word banner, some deriving it from the Latin *bandum*, a band or flag; others from the word *bann*, to summon the vassals to appear in arms, others again from the German *ban*, a field or tenement, because landed men alone were allowed a banner; and, finally, there are some who think it is a corruption of *panniere*, from *pannus*, cloth, because banners were originally made of cloth.

**BANNER**, or Standard (*vexillum*). In botany, the upper petal of a papilionaceous co-

**BANNERETS**, an ancient order of knights, or feudal lords, who, possessing several large fees, led their vassals to battle, under their own flag or banner, when summoned thereto by the king.

Anciently there were two kinds of knights, great and little; the first of these were called bannerets, the second, bachelor; the first composed the upper, the second the middle, rank. A banneret was a dignity, which, when he marched under his own banner, he was followed by a number of armed men, with estate sufficient at least 28 or 30 soldiers.

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This must have been very considerable in those days, because each man, besides his servant, had two horsemen to wait on him, armed, the one with a cross-bow, the other with a bow and hatchet.

The form of the banneret's creation was this. On a day of battle, the candidate presented his flag to the king or general, who, cutting off the train or skirt thereof, and making it a square, returned it again, the proper banner of bannerets, who are hence sometimes called knights of the square flag. There seem to have been bannerets created either in a different manner, or by others than the sovereign, since king James, in the patent of baronets, gives them precedence to all knights bannerets, except such as are created by the king himself in the field; which implies, either that there are some of this order created out of the field, or by inferior persons.

**BANNERET** is also the name of an officer or magistrate of Rome towards the close of the 14th century.

**BANNEROL** *s* (from *banderole*, Fr.) A little flag or streamer (*Camden*).

**BANNIAN** *s* A man's undress, or morning gown.

**BANNOCK** *s* A kind of oaten or pease-meal cake.

**BANNOW**, a once respectable borough town of Ireland, in the county of Wexford, situated at the entrance of the river Bannow. Lat. 52 12 N Long 6 50 W. This spot now scarcely exhibits any thing but

“a desert salt and bare,  
The haunts of seals, and ores, and sea-mews’  
clang” *Milton*

Vestiges of ruins are now traced with difficulty amid heaps of barren sand. The only remains of Bannow which were visible in 1786 were the walls of its church. There is not on or near the site of the town more than one solitary hut. The election for the representatives of the town has of late years been held on the walls of an old chimney adjoining to the church, which tumbled down piece-meal, and forms the council-table of that ancient and loyal corporation. Mem Irish Academy, vol. vi.

**BANQUET** *s* (*banquet*, Fr.) A feast (*Job*).

*To BANQUET v a* To treat any one with feasts (*Hayward*).

*To BANQUET v n* To feast; to fare daintily (*South*).

**BANQUET**, or **BANQUETTE**, in fortification, a little foot-bank, or elevation of earth, forming a path, which runs along the inside of a parapet, upon which the musketeers get up in order to discover the counterscarp, or to fire upon the enemy in the moat, or in the covert way.

**BANQUET** In horsemanship, the small part of the branch of a bridle under the eye, which, being rounded like a small rod, gathers and joins the extremities of the bit to the branch, in such a manner that the banquet is



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not seen, but covered by the cap, or the part of the bit next the branch.

**BANQUET-LINE**, in horsemanship, is an imaginary line drawn by the bit-makers, along the banquet, in forging a bit, and prolonged upwards and downwards to adjust the designed force or weakness of the branch, in order to make it stiff or easy. For the branch will be hard and strong if the sevil hole be on the outside of the banquets, with respect to the neck; and it will be weak and easy if the sevil hole be on the inside of the line, taking the centre from the neck. See the articles **BRANCH** and **SHOULDER**.

**BANQUETING-ROOM**, anciently the room in which the guests partook of the banquet. Several of the Romans had very elegant rooms for this purpose, but they were all outdone by Nero, in his banqueting-room, called *domus aurea*, which, by the circular motion of its partitions and ceilings, imitated the revolution of the heavens, and represented the different seasons of the year, which changed at every service, and showered down flowers, essences, and perfumes on the guests.

**BANSTICKLE**, in ichthyology. See **GASTEROSTEUS**.

**BANTAM**, in geography, the capital of a kingdom of the same name in the island of Java, is in lat 6 30 N lon 105 26 E. This was once a place of considerable consequence, being the great mart for pepper and other spices, whence they were distributed to the rest of the world. The chief factory of the English as well as Dutch East India Company was settled there. The merchants of Arabia and Hindostan resorted to it. Its sovereigns were so desirous of encouraging trade, by giving security to foreign merchants against the violent and revengeful disposition of the natives, that the crime of murder was never pardoned when committed against a stranger, but might be commuted by a foreigner for a fine to the relations of the deceased. This place flourished for a considerable time, but the Dutch having conquered the neighbouring province of Jacatra, where they since have built Batavia, and transferred their principal business to it, and the English having removed to Hindostan and China, and trade in other respects having taken a new course, Bantam was reduced to a poor remnant of its former opulence and importance. Other circumstances have accelerated its decline. The bay is so choked up with daily accessions of new earth washed down from the mountains, as well as by coral shoals extending a considerable way to the eastward, that it is inaccessible at present to vessels of burden, even the party who went there from the Lion, the ship which carried lord Macartney to China, was obliged to remove from her pinnace into a canoe, in order to reach the town. With the trade of Bantam the power of its sovereign declined. In his wars with other princes of Java he called in the assistance of the Dutch, and from that period he became in fact their captive. To complete the ruin of Bantam, a fire some time

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ago destroyed most of the houses, and few have been since rebuilt.

**BANTAM COOK**. See **PHASIANUS**.

**BANTAM WORK**, a kind of Indian painting and carving on wood, resembling Japan work, only decorated with a great variety of gaudy colours. Bantam work is of less value among the connoisseurs, though sometimes preferred by the unskilful to the true Japan work. Formerly it was in more use and esteem than at present, and the imitation of it much practised by our japanners. There are two sorts of Bantam as well as of Japan work, as in the latter some are flat, being even with the black, and others high and embossed, so in Bantam work some are flat and others in-cut, or carved into the wood, as we find in many large screens with this difference, that the Japan artists work chiefly in gold and other metals, and those of Bantam generally in colours, with a small sprinkling of gold here and there for the flat Bantam work is done in colours, mixed with gum water, proper for the thing designed to be imitated.

**To BANTER** *v a* (*badner*, Fr.) 'To play upon, to rally to ridicule (*L'Estrange*)'

**BANTER** *s* (from the verb) Ridicule, railery (*L'Estrange*)

**BANFLIRLR** *s* (from *banter*) One that banters (*L'Estrange*)

**BANTLING** *s* (*barnling*) A little child (*Pr*)

**BANIRY**, a town of the county of Cork, in Ireland, situated on a bay of the same name. Lat 51 36 N Lon 9 25 W.

**BAPHIL**, a word used by the ancients to express that fine red colour with which they used to illuminate the capital letters in MSS at the beginning of chapters.

**BAPTÆ**, in antiquity, an effeminate, voluptuous kind of priests at Athens, belonging to the goddess Cottyus, thus called from their stated dippings and washings by way of purification.

**BAPTISM**, in matters of religion, the ceremony of washing, or a sacrament, by which a person is initiated into the Christian church. The word is formed from the Greek *baptizo*, of *bapto* to dip or wash; but baptism is known, in ecclesiastical writers, by various other names and titles. Many learned authors have supposed that baptism had its origin from the Jewish church, in which, as they maintain, it was the practice long before Christ's time to baptize proselytes or converts to their faith, as part of the ceremony of their admission, a practice which, according to some, obtains among them to this day. A person turning Jew is first circumcised, and, when healed, is bathed or baptized in water, in presence of their rabbins, after which he is reputed a good Jew. Others, however, insist that the Jewish proselyte baptism is not by far so ancient, and that John the Baptist was the first administrator of baptism among the Jews.

The learned Grotius is of opinion, that the rite of baptism had its origin from the time of the deluge; immediately after which, he

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think, it was instituted in memory of the world having been purged by water. Some learned men think it was added to circumcision, soon after the Samaritan schism, as a mark of distinction to the orthodox Jews. Spencer, who is fond of deriving the rites of the Jewish religion from the ceremonies of the Pagans, lays it down as a probable supposition, that the Jews received the baptism of proselytes from the neighbouring nations, who were wont to prepare candidates for the more sacred functions of their religion by a solemn ablution, that, by this affinity of sacred rites, they might draw the Gentiles to embrace their religion, and that the proselytes (in gaining of whom they were extremely diligent) might the more easily comply with the transition from Gentilism to Judaism. In confirmation of this opinion he observes, first, that there is no divine precept for the baptism of proselytes, God having enjoined only the rite of circumcision for the admission of strangers into the Jewish religion. Secondly, that, among foreign nations, the Egyptians, Persians, Greeks, Romans, and others, it was customary that those who were to be initiated into their mysteries, or sacred rites, should be first purified by dipping their whole body in water. That learned writer adds, as a farther confirmation of his opinion, that the cup of blessing likewise, added to the paschal supper, seems plainly to have been derived from a pagan original for the Greeks, at their feasts, had one cup, called *ποτήριον αγαθόν* *δαίμονος*, the cup of the good demon or god, which they drank at the conclusion of their entertainment, when the table was removed. Since, then, a rite of Gentils origin was added to one of the Jewish sacraments, viz. the passover, there can be no absurdity in supposing, that baptism, which was added to the other sacrament, namely circumcision, might be derived from the same source. In the last place, he observes, that Christ, in the institution of his sacraments, paid a peculiar regard to those rites which were borrowed from the Gentiles: for, rejecting circumcision and the paschal supper, he adopted into his religion baptism and the sacred cup, thus preserving the way for the conversion and reception of the Gentiles into his church.

Salmasius, and Sucerus from him, deliver us an authentic history, that for the two first ages no one received baptism who was not first instructed in the faith and doctrine of Christ, so as to be able to answer for himself that he believed; because of these words, He that believeth, and is baptized, &c. which, in effect, is to say, that no infant, for the first two ages, was ever admitted to Christian baptism. But, after wards, they own, that such baptism came in, upon the opinion that baptism was necessary for salvation.

From the church there was a great number sent for the instruction of the new converts. The catechumen, who was not admitted, except after a long trial. The catechumen, who

were to receive it at those times, were called *conversarii*, and to these it is that St. Paul addresses his catecheses. In the apostolical age, and some time after, before churches and baptisteries were generally erected, they baptized in any place where they had conveniences, as John baptized in Jordan, and Philip baptized the eunuch in the wilderness, and Paul the sailor in his own house. But in after ages, baptisteries were built adjoining to the church; and then rules were made that baptism should ordinarily be administered no where but in these buildings.

The following were the attendant ceremonies and manner of baptism in the ancient church. The person to be baptized was first examined by the bishop or officiating priest, who put some questions to him, as, first, Whether he abjured the devil and all his works, secondly, Whether he gave a firm assent to all the articles of the Christian faith: to both which he answered in the affirmative. After the questions and answers followed exorcism; the manner and end of which was this. The minister laid his hands on the person's head, and breathed in his face, implying thereby the driving away or expelling of the devil from him, and preparing him for baptism, by which the good and holy spirit was to be conferred upon him. After exorcism followed baptism itself and first the minister, by prayer, consecrated the water for that use. Tertullian says, "any waters may be applied to that use but then God must be first invoked, and then the Holy Ghost presently comes down from heaven, and moves upon them, and sanctifies them." The water being consecrated, the person was baptized "in the name of the Father, and of the Son, and of the Holy Ghost," by which "dedication of him to the blessed Trinity, the person (says Clements Alexandrinus) is delivered from the corrupt trinity, the devil, the world, and the flesh." In performing the ceremony of baptism, the usual custom (except in clinical cases, or where there was scarcity of water), was to immerse and dip the whole body. Thus St. Barnabas, describing a baptized person, says, "We go down into the water full of sin and filth, but we ascend bearing fruit in our hearts." And this practice of immersing the whole body was so general, that we find no exceptions made in respect either to the tenderness of infants, or the bashfulness of the other sex, unless in case of sickness or other disability. But to prevent any indecency, men and women were baptized apart. To which end, either the baptisteries were divided into two apartments, one for the men, the other for the women, as Bingham has observed, or the men were baptized at one time, and the women at another, as is shown by Ysaiah, from the *Ordo Romanus*, Gregory's *Sacramentarium*, &c. Add, that there was anciently an order of deaconesses, one part of whose business was to assist at the baptism of women. The prescriptions, however, rather indicate a scrupulous attention to decency.

## BAPTISM.

that imply any indecency in the circumstance of immersion itself. From the candidates being immersed, there is at least no reason to infer that they were naked. The present Baptizer baptizes naked, though they always are.

"After immersion followed the anointment; by which (says St. Cyril) was signified that they were now cut off from the wild olive, and were ingrafted into Christ, the true olive-tree; or else to show that they were now to be champions for the gospel, and were anointed thereto, as the old athletes were against their solemn games. With this anointing was joined the sign of the cross, made upon the forehead of the person baptized, which being done, he had a white garment given him, to denote his being washed from the defilements of sin, or in allusion to that of the apostle, "as many as are baptized in Christ have put on Christ." From this custom the feast of Pentecost, which was one of the annual seasons of baptism, came to be called Whitsunday, i. e. White-sunday. This garment was afterwards laid up in the church, that it might be an evidence against such persons as violated or denied that faith which they had owned in baptism. The forms of administering baptism in our established church are well known, and need no particular description, we shall only mention one or two of the more material differences between the form as it stood in the first liturgy of king Edward, and that in the present book of common prayer. First, the form of consecrating the water did not make a part of the office in king Edward's liturgy, as it does in the present; because the water in the font was changed, and consecrated, but once a month. The form likewise itself was something different from that now used, and was introduced with a short prayer, that "Jesus Christ, upon whom (when he was baptized) the Holy Ghost came down in the likeness of a dove, would send down the same Holy Spirit, to sanctify the fountain of baptism;" which prayer was afterwards left out, at the second review.

By king Edward's first book, the minister is to dip the child in the water thrice; first, dipping the right side; secondly, the left, the third time, dipping the face toward the font. This triple immersion was a very ancient practice in the Christian church, and used in honour of the Holy Trinity, though some later writers say, it was done to represent the death, burial, and resurrection of Christ, together with his three days continuance in the grave. Afterwards, the Arians making an ill use of it, by persuading the people that it was used to denote that the three persons in the Trinity were three distinct substances, the orthodox left it off, and used only one single immersion.

By the first common prayer of king Edward, after the child was baptized, the godfathers and godmothers were to lay their hands upon it, and the minister was to put on him the white vestment commonly called the chrysome, and to say, "Take this white vesture, as a token of the innocence, which, by God's grace, in this holy

sacrament of baptism, is given unto thee; and for a sign, whereby thou art admonished as long as thou livest, to give thyself to immortality of living, that after this transitory life thou mayest be partaker of the life everlasting. Amen." As soon as he had pronounced these words, he was to anoint the infant on the head, saying, "Almighty God, the father of our Lord Jesus Christ, who hath regenerated thee by water and the Holy Ghost, and hath given unto thee remission of all thy sins, may he vouchsafe to anoint thee with the anointment of his Holy Spirit, and bring thee to the inheritance of everlasting life. Amen." This was manifestly done in imitation of the practice of the primitive church.

Sprinkling children, instead of dipping them in the font, a custom which at first was allowed only in case of the weakness or sickness of the infant, has now so far prevailed, that immersion is at length quite excluded. What principally tended to confirm the practice of affusion or sprinkling was, that several of our protestant divines, flying into Germany and Switzerland during the bloody reign of queen Mary, and returning home when queen Elizabeth came to the crown, brought back with them a great zeal for the protestant churches beyond sea where they had been sheltered and received, and having observed, that at Geneva and some other places baptism was administered by sprinkling, they thought they could not do the church of England a greater piece of service than by introducing a practice dictated by so great an oracle as Calvin. This, together with the coldness of our northern climate, was what contributed to banish entirely the practice of dipping infants in the font.

Several of the Socinians have maintained that baptism was only to be used by those who are converted to Christianity from a different profession, and that though the children of such proselytes were to be baptized with their parents, all who descended from them were to be considered as baptized in them; and they urge the practice of proselyte baptism among the Jews in support of this opinion.

Some theological authors distinguish three kinds of baptism, 1. Water baptism, which is that above mentioned. 2. Baptism of fire, which, they say, is the perfect love of God, joined with an earnest desire to be baptized, called also the baptism of the Holy Ghost. 3. Baptism of blood, which is the martyrdom of a catechumen.

BAPTISM OF THE DEAD, a custom which anciently prevailed among some people in Africa, of giving baptism to the dead. The third council of Carthage speaks of it as a thing that ignorant Christians were fond of. Gregory Nazianzen also takes notice of the same superstitious opinion prevailing among some who delayed to be baptized. In his address to this kind of men, he asks, whether they would be baptized after death? Philastrius also notes it as the general error of the Monophysites or Eutychians, that they baptized men after death. The practice seems to be grounded on

of baptism, that when men had neglected to receive baptism in their life-time, some compensation might be made for this default by receiving it after death.

**BAPTISM OF THE DEAD** was also a sort of vicarious baptism, formerly in use, where a person dying without baptism, another was baptized in his stead, a practice founded on 1 Cor. xv. 29 concerning the sense of which passage critics have been much divided.

**BAPTISMAL**, something belonging to, or connected with baptism. Thus we say, baptismal engagement, baptismal presents, &c.

**BAPTISMAL** belonging or relating to baptism; as baptismal vow, fonts, presents, &c.

**BAPTISTERY**, in ecclesiastical writers, a place in which the ceremony of baptism is performed. In the ancient church it was one of the exedrae or buildings distinct from the church itself, and consisted of a porch or anteroom where the persons to be baptized made their confession of faith, and an inner room where the ceremony of baptism was performed. Thus it continued till the sixth century, when the baptisteries began to be taken into the church-porch, and afterwards into the church itself.

The ancient baptisteries were commonly called *palæstræ*, *photisteria*, q d places of illumination; an appellation sometimes given to baptism. Or they might have the name for another reason, because they were the places of an illumination, or instruction, preceding baptism for here the catechumens seem to have been trained up and instructed in the first rudiments of the Christian faith.

Those baptisteries were anciently very capacious, because, as Dr Caye observes, the stated times of baptism returning but seldom, there were usually great multitudes to be baptized at the same time. and then the manner of baptizing, by immersion, or dipping under water, made it necessary to have a large font likewise. In Venantius Fortunatus it is called *aula baptismatis*, the large hall of baptism, which was indeed so capacious, that we sometimes read of councils meeting and sitting therein. This hall, or chapel, was always kept shut during Lent, and the door sealed up with the bishop's seal, not to be opened till Maundy-Thurseday.

**BAPTISTS**, in ecclesiastical history, from *baptizo*, I baptize, a denomination of Christians, distinguished from other Christians by their particular opinions respecting the mode and the subjects of baptism.

It is alleged by this sect, that instead of administering the ordinance by sprinkling or pouring water, it ought to be administered only by immersion. Such being, as they the meaning of the word *baptizo*, so that a command was given to immerse. Thus it was understood by those who first administered baptism, and the apostles of Jerusalem, and other churches, and the subjects are going down into, and coming up

again out of the water, and the baptized are said to be buried in baptism, and to be raised again, which language could not, they say, be properly adopted on supposition of the ordinance being administered in any other manner than by immersion. Thus also, they say it was in general administered in the primitive church. Thus it is now administered in the Russian and Greek church, and thus it is, at this day, directed to be administered in the church of England, to all who are thought capable of submitting to it in this manner. With regard to the subjects of baptism, the Baptists say, that this ordinance ought not to be administered to children or infants at all, nor to grown up persons in general, but to adults only of a certain character and description. Our Saviour's commission to his apostles, by which Christian baptism was instituted, is to go and teach all nations, baptizing them, that is, not to baptize all they meet with, but first to instruct them—to teach all nations, or to preach the gospel to every creature—and whoever receives it, him to baptize in the name of the Father, and of the Son, and of the Holy Ghost. To such persons, and to such only, baptism appears to have been administered by the apostles, and the immediate disciples of Christ. They are described as repenting of their sins, as believing in Christ, and as having gladly received the word. Without these qualifications, Peter acquaints those who were converted by his sermon, that he could not have admitted them to baptism, Philip holds the same language in his discourse with the eunuch, and Paul treats Lydia, the jailor, and others, in the same manner. Without these qualifications, Christians in general think it wrong to admit persons to the Lord's supper, and, for the same reasons, without these qualifications, at least a profession of them, the Baptists think it wrong to admit any to baptism. Wherefore they withhold it, not only from the impenitently vicious and profane, and from infidels who have no faith, but also from infants and children, who have no knowledge, and are incapable of every action civil and religious. They further insist, that all positive institutions depend entirely upon the will and declaration of the institutor, and therefore, that reasoning by analogy from abrogated Jewish rites is to be rejected, and the express commands of Christ respecting the mode and subjects of baptism ought to be our only rule.

In England the Baptists form one of the denominations of Protestant Dissenters. They separate from the establishment for the same reasons as their brethren of the other denominations do; and from additional motives derived from their particular tenets respecting baptism. The constitution of their churches, and their modes of worship, are congregational or independent; in the exercise of which they are protected in common with other dissenters by the act of toleration. Before this act, they were liable to pains and penalties as Nonconformists; and often for their peculiar sentiments as Baptists. A proclamation was issued out

against them, and some of them were burnt in Smithfield in 1538. They bore a considerable share in the persecutions of the last and of the preceding centuries; and, as it should seem, in those of some centuries before, for there were several among the Lollards and the followers of Wickliffe who disapproved of infant-baptism. There were many of this persuasion among the Protestants and reformers abroad. In Holland, Germany, and the North, they went by the names of ANABAPTISTS, and MENNONITES; and in Piedmont and the South, they were found among the ALBIGENSES and WALDESES. See those articles.

The Baptists go under two denominations, viz the Particular or Calvinistical, and the General or Arminian. The former is by far the most numerous. Some of both denominations allow of mixed communion, viz of persons who have been sprinkled in their infancy, and therefore unbaptized in the view of the Baptists, others disallow it, and some of them observe the seventh day of the week as the sabbath, apprehending the law that enjoined it not to have been repealed by Christ or his apostles. But a difference of opinion respecting these and other matters is not peculiar to the Baptists: it is common to all Christians, and to all bodies of men who think and judge for themselves in religious matters.

The Baptists have two exhibitions for students to be educated at one of the universities in Scotland, given them by Dr Ward of Gresham college. They have likewise an academy at Bristol, generally known by the name of the Bristol Education Society, another society was formed about four years ago in London, for the instruction of young men for the pastoral office, and another institution was opened in Yorkshire about two years ago for the same purpose. Among the writers of repute in this denomination we may mention the names of Beddome, Booth, Dore, Evans, Foster, Fuller, Gill, Hall, Jenkins, Richards, Robinson, Ryland, Stennett, &c.

The ceremony of baptizing adults by immersion has too often been the subject of ridicule and misrepresentation, but we have perused with satisfaction an account of this ceremony which certainly affords no real ground of ridicule, and which we should be sorry to misrepresent. As it is too long to admit of insertion here, we must refer the candid reader to Evans's Sketch of Religious Denominations, p 137, ed 5, where it may be found as copied from Robinson's History of Baptism. See also Dyer's Life of Robinson.

To those who are desirous of knowing and consulting the principal works on the question of baptism the following list may be interesting. In defence of the practice of infant baptism may be mentioned Dr Fleming's "Plea for Infants," and the appendix and his defence, Dr Taylor's "Covenant of Grace; and Baptism the Token of it, explained upon Scripture Principles," Mr. Breckell's "Pædobaptism," and "Pædobaptism defended," Dr Addington's "Christian Minister's Reasons for bap-

tizing Infants, and for administering the Ordinance by sprinkling or pouring of Water," the same author's "Summary of the Christian Minister's Reasons for baptizing Infants," Mr. Amner's "Account of the Occasion and Design of the positive Institutions of Christianity," Mr Robin's edition of Matthew Henry's Manuscript Treatise on Baptism, and Dr Edward Williams's "Antipædobaptism examined."

On the opposite side of the question, recourse may be had to Mr Burrough's "Two Discourses on positive Institutions," Dr Gill's "Answer to Mr Towgood's Baptism of Infants a reasonable Service," the same writer's "Antipædobaptism, or Infant Baptism an Innovation," Dr Stennett's "Remarks on the Christian Minister's Reasons for administering Baptism by sprinkling, &c," Mr Jenkins's "Inconsistency of Infant Sprinkling with Christian Baptism, with religious Usefulness, and with Salvation by Christ alone," Mr Maclean's "Christ Commission," Mr Richards's "History of Antichrist, or Free Thoughts on the Corruptions of Christianity," Mr Booth's "Pædobaptism examined, &c," Mr Robinson's "History of Baptism" and his "Ecclesiastical Researches," Mr Ashdowne's "New and decisive Proofs from Scripture and Reason, that Adults only are included in the Design of the new Covenant, &c

To these may farther be added, Mr De Courcy's "Letter to a Baptist Minister," his "Word to Parmenas," "Reply to Parmenas," and "The Rejoinder." Mr Booth's Defence of "Pædobaptism examined." Mr W Miller's "Catholic Baptism examined," and his "Pædobaptist Mode of administering the baptismal Ordinance defended." Mr Peter Edwards's "Candid Reasons for renouncing the Principles of Antipædobaptism." Dr Jenkins' Answer in a "Defence of the Baptists, &c." Mr Edwards's "Critical Remarks on Dr Jenkins's Defence of the Baptists." Mr Dore's "Sermons on Baptism."

**To BAPTIZE** *v a* (*baptiser*, French, from βαπτίζω) To christen, to administer the sacrament of baptism to one (*Rogers*)

**BAPTISER** *s* (from *to baptize*) One that christens, one that administers baptism.

**BAR** *s* (*barre*, French) 1 A piece of wood, or other matter, laid across a passage to hinder entrance (*Exodus*) 2 A bolt (*Nehemiah*) 3 Any obstacle (*Daniel*) 4 A rock, or bank of sand, at the entrance of a harbour 5 Any thing used for prevention (*Hooker*) 6 The place where causes of law are tried (*Dr*) 7 An enclosed place in a tavern, where the housekeeper sits (*Addison*) 8. (In law) A peremptory exception against a demand or plea (*Cowell*) 9 Any thing by which the compartments or structure is held together (*Jonah*).

**BAR**, **BARRE**, or **BARRE**, in heraldry, denotes an ordinary nearly resembling the sea, from which it only differs by its narrowness, and by this, that the bar may be placed in any part of the field, whereas the sea is confined to a single place.



# BAR

the vein when become diseased at various points. In order to bar a vein, the farmer opens the skin above it, and after disengaging it, and tying it above and below, he divides the skin between the two features.

**BARLE DUC**, the capital of the territory of Bar, now of a district in the department of Meuse, in France, having a strong castle. It is 126 miles E. of Paris. Lat. 48 44 N. Lon. 6 30 E.

**BAR-SUR-AUBE**, a town of France, in the department of Aube, and late province of Champagne. Lat. 48 15 N Lon. 4 58 E

**BAR-SUR-SEINE**, a town of France, in the department of Aube. Lat. 48 5 N Lon. 4 32 E

4. 30 E  
BARA, one of the Hebrides, to the south  
of St. Uist. Lat 56 55 N. Lon. 7 30 W.

BARA, the name of a very extraordinary festival celebrated at Messina, in honour of the assumption of the Virgin. At this feast a great number of children, who represent the Virgin, the apostles, cherubim, and seraphim, are placed upon a large whirling machine, which is turned round by a number of monks. When the whole is in motion, it is said to represent the situation of the apostles, &c. when gazing at the ascending Virgin. The people are so delighted with this festival, that parents very ardently solicit for the felicity of having their children among the apostles or cherubim at the Bara.

**BARABINIANS**, a nation of the Russian empire, also called **BARABINZIANS** See below

**BARABINZIANS**, a tribe of Tartars, living on both sides of the river Irtis. They seem to derive their name from the Barabain desert, whose lakes supply them abundantly with fish, on which and their cattle they chiefly subsist. They have plenty of game and wild-fowl of every kind, particularly ducks and puffins. Most of them are heathens, but Mahometanism daily gains ground among them.

BARACH, (from borak, splendid, Arab)  
Nurs

**BARACKS** See **BARRACKS**.  
**BARÆ**, in ancient geography, a people of India, placed by Ptolemy near the Ganges

**BARALIPTON.** Among logicians, a term denoting the first imperfect mode of the first figure of syllogism. A syllogism in baralip-ton, is when the two first propositions are ge-neral, and the third particular, the middle term being the subject in the first proposition, and the predicate in the second. The follo-wing is of this kind.

B.A. Every evil ought to be feared  
A.A. Every violent passion is an evil,  
LIT Therefore something that ought to  
be feared is a violent passion

BARANGI officers among the Greeks of the lower empire, whose business it was to keep the keys of the city gates where the emperor resided. Cosmas says, barangi were those who stood guard at the door of the emperor's bed-chamber and dining-room. Cosmas also observes that the name is

English, seemed from bar, to shut; and that the barangi were Englishmen, by country; Anglo-Danes, who, being driven out of England, were received into the service of the emperor at Constantinople, and made guards of the city.

When they are Lania, by Cujacensis, professors; by accuracy, as being armed with a battle-scuris. Codinus adds, that they still spoke the English tongue. Anna Comnena says, the barangi came from the island Thule, by which is, doubtless, meant our island.

**BARA-PICKLET**, bread made of fine flour kneaded with barm, which makes it very light and spongy. barm being the Welch for bread. In the north of England it is formed into flat cakes, which are called picklets.

**BARATHRUM**, in antiquity, a deep dark pit at Athens, into which condemned persons were cast headlong. It had sharp spikes at the top, that no man might escape out, and others at the bottom, to pierce and torment such as were cast in.

**BARATIER** (John Philip), an extraordinary youth, born at Schwobach, near Nuremberg, in 1721. At five years old he is said to have understood Greek, Latin, German, and French. His father, who was minister of the French church at Schwobach, then taught him Hebrew, and at 9 years of age he was able to translate any part of the Scripture into Latin. In 1721, he was entered in the university of Altdorf, and the same year wrote a letter to M. le Maître on a new edition of the Bible, Hebrew, Chaldaic, and Rabbinical, which is inserted in the Bibliothéque Germanique. The year following, he published the travels of Benjamin of Tudela, translated from the Hebrew into French. In 1734, the margrave of Anspach settled upon him a pension of 50 florins a year, and gave him the free use of his library. In 1735, he sent a scheme for finding the longitude to the Royal Society, but it was found to have been an old invention, and insufficient. He was the same year admitted a member of the academy at Berlin. Soon afterwards he published a work against the Socinians, called, Anti-Artemonius, 8vo, 1735. The same year he was created M. A. by the university of Halle. This wonderful youth died of a decline in 1740, aged little more than 19. Besides the works abovementioned, he wrote some critical dissertations upon points of ecclesiastical history in the Bibliothéque Germanique (*Walsh*).

**BARATRY**, in law, the moving suits, taking and detaining houses and lands, &c., upon false inventions. In a marine sense, baratry denotes the cheating either the owners or insurers of ships, by sinking the vessel, deserting her, embarking the cargo, &c., whether by master or mariners.

**BARBA** (barba, a beard, Latin.) 1 Any thing that grows in the place of a beard (*Walton*). 2 The point that stands backward in an arrow, or fishing-hook (*Pope*). 3 The armour for horses (*Raynwald*).

**BARB**, or **BARRE**, a kind of horse brought

from Barbary, much esteemed for its beauty, vigour, and swiftness. (See *HORSE*.) These horses are usually very elegant; of a slender make, and have very fine limbs and fine turned bodies. The Spanish and English horses have much fuller bodies, and larger legs. The barb is little inferior to the Arabian or Turkish horse; but he is esteemed by our dealers too tender and delicate to breed from. The Turkish and the Spanish horses are therefore usually kept for this purpose by the nicer judges.

**BARB** (*ῥαχίς, glochis*) In botany, a straight process, armed with several teeth pointing backwards, like the sting of a bee. This is one sort of pubescence in plants, and is distinguished from the hook (*hamus*) by the point not being bent.

**BARB** In botany. See **BEARD**.  
To **BARB** *v a* (from the noun) 1 To shave, to dress out the beard (*Shakspeare*). 2 To furnish horses with armour (*Dryden*). 3 To jag arrows with hooks (*Philips*).

**BARBACAN** (*barbacane, French*). 1 A fortification before the walls of a town (*Spenser*). 2 A fortress at the end of a bridge. 3 An opening in the wall through which the guns are levelled.

**BARBACENIA** In botany, a genus of the class hexandria, order monogynia. Calyx superior, six-toothed, corol six-petalled, filaments petal-shaped, toothed, capsule glandular, three valved, many-seeded. One species only, a native of Brasil.

**BARBA CAPRIÆ** See **ULMARIA**.

**BARBA HIRCI** See **TRAGOPOGON**.

**BARBA JOVIS** See **SEDUM NAJUS**.

**BARBADOES**, the most easterly of the Caribbee islands, in the West Indies. It is in general a level country, though a little diversified with hills. When the English first landed here it had not the least appearance of having ever been peopled, even by savages, there not being any kind of beast of pasture or prey, no fruit, herb, nor root, fit for the support of human life. The number of white inhabitants is about 20,000, and the negro slaves amount to about 100,000. This island is subject to hurricanes, particularly in July and August. It was nearly ruined by the dreadful hurricane which happened in October 1780. It is about 25 miles long, and 15 broad. The capital of Barbadoes is Bridge-town, which is situated in lat. 13. 10 N lon 59 10 W. The other towns are Ostons or Charles-town, St. James's, and Spaight's-town.

**BARBADOES CHERRY** The fruit of the malpighia glabra of Linnæus. These cherries are of a red colour, of the size of small cherries, and are gathered and eaten by the inhabitants of the West-India islands, particularly Barbadoes. In moderate quantity they are considered as wholesome, though very inferior to cherries.

**BARBADOES BUT** See **RISCHUS MAYOR**.

**BARBADOES TAR** See **PERUVIANUM BARBADENSE**, and **BTUMEN**.

**BARBARA**, among logicians, the first mode of the first figure of syllogisms. A syllo-



## BAR

gism of *barbara* is one whereof all the propositions are universal and affirmative, the middle term being the subject of the first proposition, and attribute in the second

*Examp* BAR. Every wicked man is miserable,

BA All tyrants are wicked men;

RA Therefore all tyrants are miserable

**BARBARÆA** The leaves of this plant, *erysimum barbaræa*, *folus lyratis*, extimo subrotundo of Linnæus, may be ranked amongst the antiscorbutics they are seldom used

**BARBARIAN**, a name given by the ancient Greeks and Romans to all who were not of their own country, or were not initiated in their language, manners, and customs. In this sense, the word signified with them no more than foreigner, not signifying, as among us, a wild, rude, or uncivilized person. Strabo derives the word *βάρβαρος* from *βάρβαρος*, *barbure*, because foreigners coming to Athens used to stammer, or speak coarsely. Others derive it from *βάρβαρος*, a word that foreigners frequently stumbled on, which yet had no meaning

**BARBARIAN**, likewise, denotes an inhuman person, a man void of pity or feeling

**BARBARICARII**, in antiquity, artists who decorated shields with gold and silver. Sometimes the word is used for those who wore shields or masks thus decorated

**BARBARICK** *a* (*barbaricus*, Latin) Foreign, far-fetched (*Milton*)

**BARBARISM**, in grammar, denotes an offence against the purity of style or language. A barbarism differs, according to Isidore, from a barbarous term, as the former, for instance, is Latin, though corrupt or misused, whereas the latter, which this writer called *barbarologia*, is a word merely foreign, intruded into Latin speech

In general, under the term barbarisms are comprehended things written, spoken, declined, or conjugated wrong, or used in a wrong quantity, or in an unusual sense, as when a word is used which is foreign to the language, and not received by the better and purer sort of writers. Such are *hyper* for *liber*, *syllaba* for *syllaba*, *patri* for *patris*, *levi* for *legi*, *bannus* for *proscriptio*, &c. Barbarism is often charged, with great justice, on modern writers in the learned languages. The Latin books of late ages are full of Anglicisms, Gallicisms, Germanisms, &c., according to the country of the author. But what shall we say to Casp. Scioppius, who accuses Cicero himself of barbarisms in his own language?

**BARBARISM**, **BARBARIES**, is also used for that rudeness of mind, wherein the understanding is neither furnished with useful principles, nor the will with good inclinations

**BARBARITY** *s* (from *barbarous*) 1 Savageness, uncivility 2 Cruelty, inhumanity (*Glarendon*) 3 Impurity of speech (*Sw*)

**BARBAROUS** *a* (*barbare*, French) 1 Stranger to civility, savage; uncivilized (*Da*)

## BAR

2 Ignorant, unacquainted with arts (*Dry*)

3 Cruel; inhuman (*Glarendon*).

**BARBAROUSLY** *adv* (from *barbarous*)

1. Ignorantly; without knowledge or arts 2

In a manner contrary to the rules of speech 3 Cruelly; inhumanly (*Spectator*).

**BARBAROUSNESS** *s* (from *barbarous*)

1 Incivility of manners (*l'empire*) 2, Impurity of language (*Brerewood*) 3. Cruelty (*Hale*).

**BARBARUS**, in ichthyology, a species of *syngnethus*, found in European seas, having neither caudal nor anal fin, body ~~side~~

**BARBARY**, a country of Africa, included between the Atlantic ocean, the Mediterranean sea, and Egypt, and containing the kingdoms of Barca, Tripoli, Tunis, Algiers, Fes, and Morocco. It is near 2000 miles in length, and, in some places, 750 in breadth. It was known to the ancients by the names of Mauritania, Numidia, Proper Africa, and Libya. It is the best country in all Africa, except Egypt, and fertile in corn, maize, wine, citrons, oranges, figs, almonds, olives, dates, and melons. Their chief trade consists in their fruits, in the horses called *barbs*, *Morocco* leather, ostrich-feathers, indigo, wax, tin, and coral. The established religion is the Mahometan, and there are some Jews; but no Christians, except the slaves

Concerning the origin of the name *Barbary* there are many conjectures. According to some, the Romans, after they had conquered this large country, gave it that name out of contempt and dislike to the barbarous manners of the natives, according to the custom of calling all other people but themselves barbarians. Marmol, on the contrary, derives the word *Barbary* from *Berber*, a name which the Arabs gave to its ancient inhabitants, and which they retain to this day in many parts of the country, especially along the great ridge of the mountains of Atlas, and which name was given them on account of the barrenness of their country. According to Leo Africanus, the name of *Barbary* was given by the Arabs on account of the strange language of the natives, which appeared to them more like a murmur or grumbling of some brute animals than articulate sounds. Others, however, derive it from the Arabic word *bar*, signifying a desert twice repeated, which was given by one *Isac*, or *Africus*, a king of Arabia, from whom the whole continent of Africa is pretended to have taken its name. According to them, this king being driven out of his own dominions, and closely pursued by his enemies, some of his retinue called out to him *Lat, bar*, that is, To the desert, To the desert, from which the country was afterwards called *Barbary*.

Among the Romans this country was divided into the provinces of Mauritania, Africa Propria, &c. and they continued absolute masters of it from the time of Julius Cæsar till the year of Christ 428.

**BARBATE** In botany. See **BEARDED**  
**BARBATELLI** (Bernardino), an eminent

## BAR

**Italian painter** He was the disciple of Ghirlandajo, at Florence He afterwards went to Rome, where he studied with so much assiduity, as frequently to forget the refreshments of food and sleep He excelled in painting history, fruit, animals, and flowers He died in 1612, aged 70

**BARBE, or BARB** See **BARB**

**BARBE**, in the military art To fire in barbe, means to fire the cannon over the parapet, instead of firing through the embrasures, in which case, the parapet must not be above three feet and a half

**BARBE, or BARDE**, is an old word, denoting the armour of the horses of the ancient knights and soldiers, who were accoutred at all points It is said to have been an armour of iron and leather, wherewith the neck, breast, and shoulders of the horse were covered

**BARBE, (St)** a town of New Biscay, in Mexico, North America In its neighbourhood are several silver mines Lat 26 0 N Lon 107 5 W

**BARBECINO**, a territory of Africa, over against the Cape de Verd Islands

**To BARBECUE** *v a* To dress a hog whole, by broiling (*Pope*)

**BARBECUE** *s* A hog dressed whole

**BARBED** *particip a* (from *to barb*) 1 Furnished with armour (*Shakspeare*) 2 Bearded, jagged with hooks (*Milton*)

**BARBED AND CRESTED**, in heraldry, an appellation given to the combs and gills of a cock, when particularized for being of a different tincture from the body

A barbed cross, is a cross the extremities whereof are like the barbed irons used for striking great fish

**BARBEL**, in ichthyology See **CYPRINUS BARBELICOTÆ**, an ancient sect of gnostics, spoken of by Theodoret Their ceremonies were abominable, and their doctrines too ridiculous to deserve a particular description

**BARBER**, (from *barba*, a beard,) one who makes a trade of shaving the beards and heads of men, and of making wigs, &c Formerly the business of a surgeon was united to that of a barber, and he was denominated a barber-surgeon This union of profession was dissolved by a statute of Henry VIII, by which the surgeons were formed into a distinct corporation, that existed till the late establishment of the Royal College of Surgeons of London In England a musical instrument was part of the furniture of a barber-surgeon's shop, which was used by persons above the ordinary level of life, who resorted thither for the cure of wounds, for bleeding, or trimming, a word that signified shaving, and cutting, or curling the hair Bleeding and tooth-drawing are now very commonly practised in country places by barbers, and the pole stuck out as the sign of their profession, is supposed to indicate the staff which is held in the patient's hand during the act of bleeding, and the fillet with which it is wound, tied up after the operation is completed

**BARBERS (Company of)** See **COMPANY**

## BAR

**BA'RBEE** *s* (from *to barb*) A man who shaves the beard (*Wotton*)

**To BA'RBEE** *v a* (from the noun) To dress out, to powder (*Shakspeare*)

**BA'RBEE-CHIRURGI ON** *s* A man who joins the practice of surgery to the barber's trade; a low practitioner of surgery (*Weseman*)

**BARBERINO**, a town of Tuscany, in Italy, at the foot of the Appennines Lat 43 59 N Lon 11 15 E

**BAR'BER MONGER** *s* A fop, a man decked out by his barber (*Shakspeare*)

**BAR'BERRY** *s* (*berberis*, Lat) Piperidge bush See **BERBERIS**

**BARBEL**, in mastology See **CANIS**

**BARBET**, in ornithology See **BUCCO**

**BARBETS**, in geography, the name of the inhabitants of several valleys in Piedmont

**BARBEYRA** (John), was born in Bessiers, in Lower Languedoc, in 1674 He was made professor of law and history at Lausanne, in 1710, which he enjoyed for seven years, and during that time was three times rector in 1717, he was professor of public and private law at Gromingen He translated into French the two celebrated works of Puffendorf, his Law of Nature and Nations, and his Duties of a Man and a Citizen, to both which he wrote excellent notes, and to the former an introductory preface He translated also Grotius's treatise De Jure Belli ac Pacis, with large and excellent notes, and several of Tillotson's sermons He wrote a work entitled *Traite de Jeu*, two vols 8vo

**BARBICAN** See **BARRACAN**

**BARBIERI** (John Francis), an eminent historical painter, born near Bologna, in 1590, and who studied under the Caracci He followed the manner of Caravaggio His taste of design was natural, easy, and often grand, but without any extraordinary share of elevation, correctness, or elegance The airs of his heads often want dignity, and his local colours want truth However, there is great union and harmony in his colours, although his carnations are not very fresh, and in all his works there is a powerful and expressive imitation of life, which will for ever render them estimable Towards the decline of his life, he observed that the clearer and brighter style of Guido and Albano had attracted the admiration of all Europe, and therefore he altered his manner, even against his own judgment But he apologized for that conduct, by declaring, that in his former time he painted for fame, and to please the judicious, and he now painted to please the ignorant, and enrich himself He died in 1666 The most capital performance of Guercino, is the history of S Petronilla, which is considered as one of the ornaments of St Peter's at Rome, and is much admired by travellers

**BARBILLONS** in the natural history of insects, are certain bodies, usually two in number, placed under the creature's head, and moveable at pleasure, somewhat resembling hands or fingers placed on a short or broken

## B A R

**arai.** The word is a diminutive of the French *barbe*, beard.

**BARBING** is sometimes used in ancient statutes for sheering. Cloth is not to be exported till it be barbed, rowed, and elorn 3 Hen VII c 11

**BARBITOS**, or **BARRITON**, an ancient instrument of music, mounted with three, others say seven, strings, much used by Sappho and Alcæus, whence it is also denominated Lesboun.

**BARITONO**, a male voice, the compass of which partakes of those of the common bass and the tenor.

**BARBS**, or **BARBLES**, small excrescences under the tongue of a horse, which may be discovered by drawing it aside. They are cured by cutting them close off, and touching the roots with lunar caustic.

**BARBUDA**, one of the Caribbee islands in the West Indies, about twenty miles long, and twelve wide. The land is low, fruitful, and populous. It is the property of the Codrington family. Lat 18° 30' N Lon 61° 50' W

**BARBUS**, in ichthyology. See **CYPRINUS**.

**BARCA**, a country of Africa, between Tripoli and Egypt. It is a barren desert, chiefly inhabited by some tribes of wandering Arabs. In this country stood the famous temple of Jupiter Ammon, and notwithstanding the pleasantness of the spot where it was erected, this part of the country is said to be the most dangerous of any, being surrounded with vast tracks of quick and burning sands, which are very detrimental to travellers, not only as they sink under their feet, but being light, and heated by the rays of the sun, are easily raised by every trifling breeze of wind, which, if it be in their faces, almost burns their eyes out, and stifles them, or, if vehement, overwhelms them. Cambyzes, the king of Persia, dispatched a formidable army, which consisted of 50,000 men, against this temple, they set out from Thebes, in Upper Egypt, and under the conduct of proper guides reached the city of Oasis, seven days journey from that place, but what was their fate afterwards is uncertain, as none of them ever returned to their own country again. The Ammonians informed Herodotus, that, after the army had entered the sandy desert which lies beyond Oasis, a violent wind began to blow from the south, at the time of their dinner, which raised the sand to such a degree, that the whole army was overwhelmed and buried alive.

## B A R

**BARCALAO**, a Spanish word. the French pronounce it *baccalau*, and give the name to the cod-fish.

**BARCAROLLA**, in music, a song in the Venetian language, sung at Venice by the gondoliers. the airs are often composed by the gondoliers themselves, and are celebrated by Rousseau and the earl of Leicester, for the sweetness and novelty of their melodies.

**BARCELONA**, a large and strong city of Catalonia, in Spain. It is the see of a bishop, and has a good harbour. It contains about 15,000 houses. It is divided into the New and Old Towns, which are separated from each other by a wall and a ditch. The inhabitants carry on an extensive trade. This city was united to the crown of Arragon in 1131, by the marriage of don Raymond V count of Barcelona, with the daughter of don Ramiro the monk, king of Arragon. It was taken by the French after a siege of fifty-two days, in 1697. Lord Peterborough got possession of it in 1705, and in 1714 it was taken by the French and Spaniards, after a long siege, when it was deprived of its privileges, and the citadel built to keep it in awe. It is 250 miles E of Madrid. Lat 41° 26' N Lon 2° 13' E.

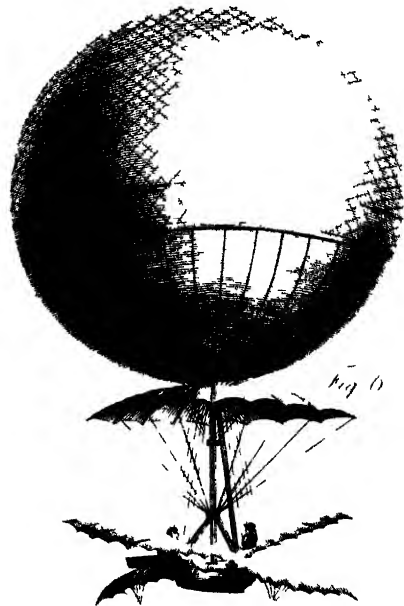
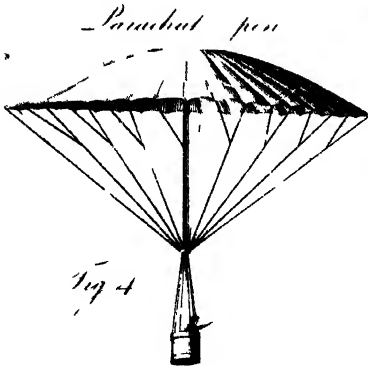
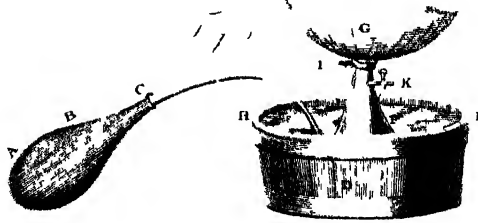
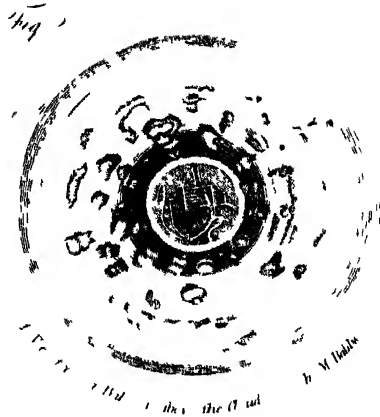
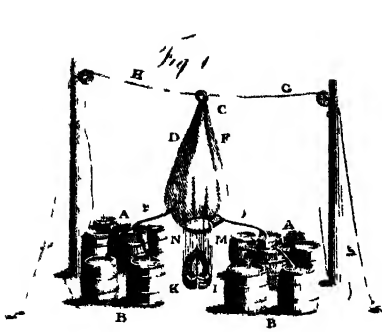
The port of Barcelona exports its silks, middling cloths, and cotonades, wines, brandies, and other productions, and if we wish to judge of the part the Catalonians take in this commerce, it must be observed, that in 1782, out of six hundred and twenty eight vessels which entered Barcelona, three hundred and seventeen belonged to Spain. It is true that silks from Lyons, stockings from Nimes, several kinds of stuffs and cottons, notwithstanding the prohibition, and particularly dried cod, an article for which Spain pays annually to the English three millions of piastres, pass into Catalonia by the same port. Barcelona was erected into a county by Charlemagne, and became an independent sovereignty in the year 873 or 884. The king of Spain is called the count of Barcelona. The diocese contains 213 parishes, besides eight in the city.

**BARCELORE**, a town on the Malabar coast, in the East Indies. Lat 13° 25' N Lon 74° 15' E.

**BARCELOS**, a town of Portugal, in the province of Entre Minho e Douro. Lat 41° 30' N Lon 8° 20' W.

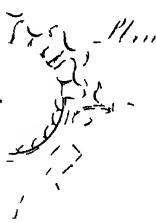
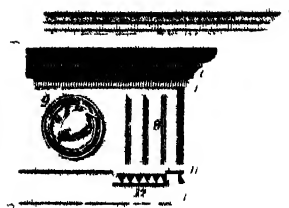
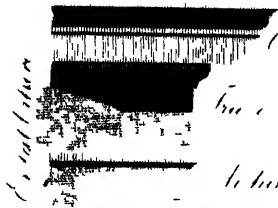
**BARCHOCHERAS**. See **BARCOCHERAS**.

END OF THE FIRST VOLUME





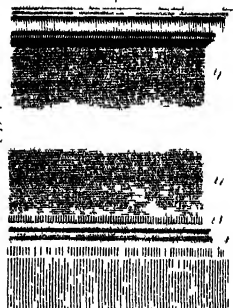
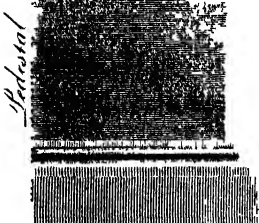
Angular view of the Corinthian Capital



Height of the Capital



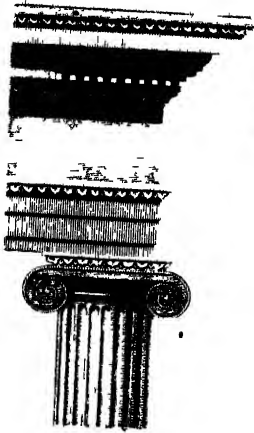
- 1 Height
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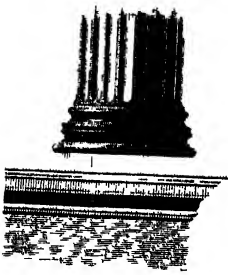
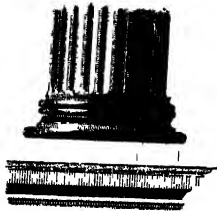
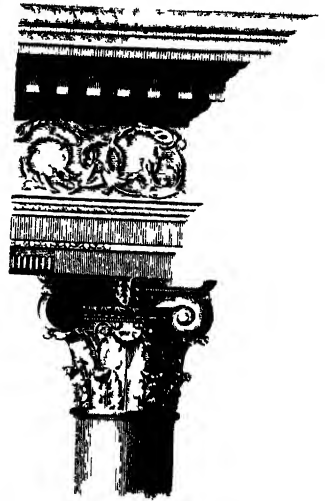
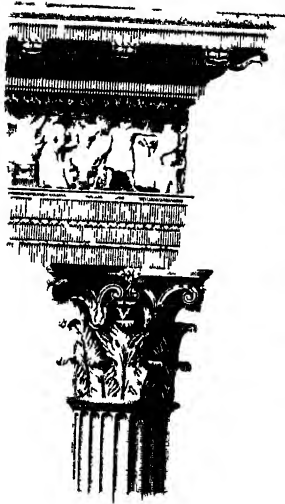




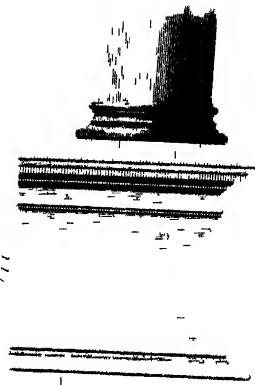
# ARCHITECTURE



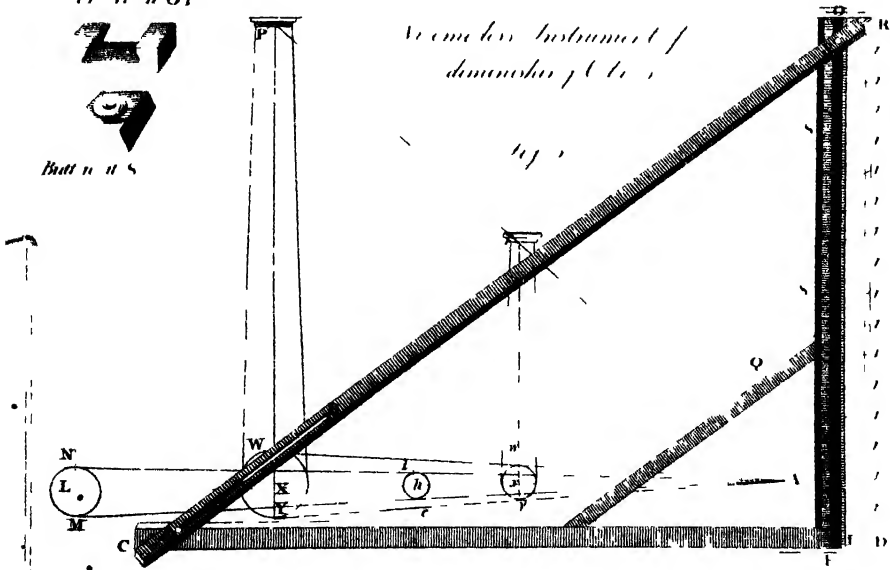
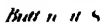
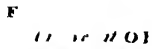
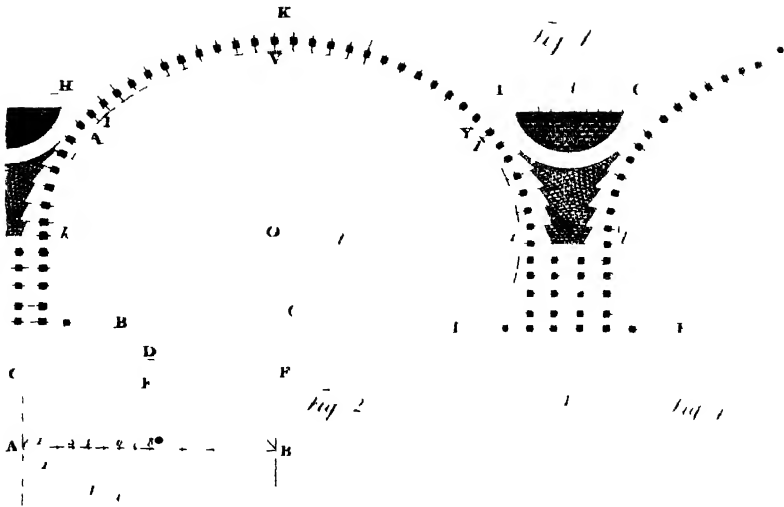
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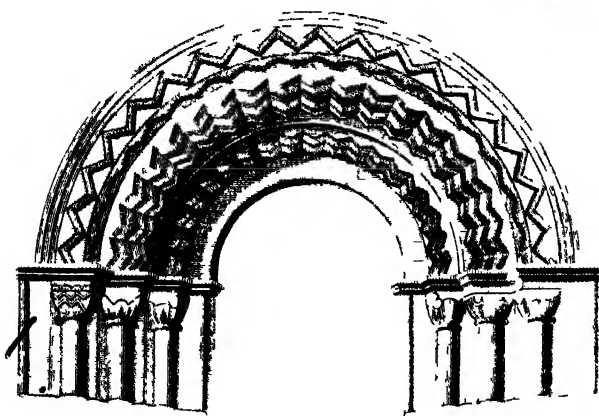
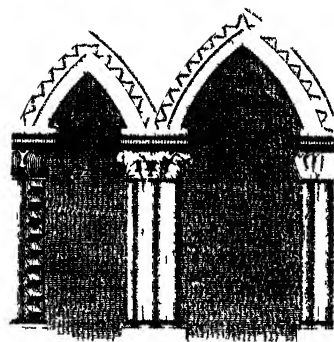
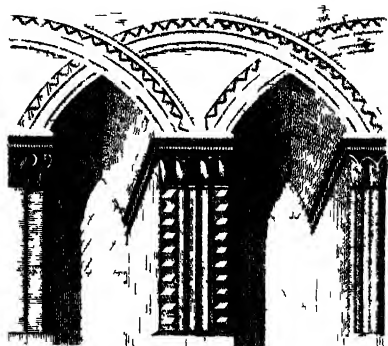
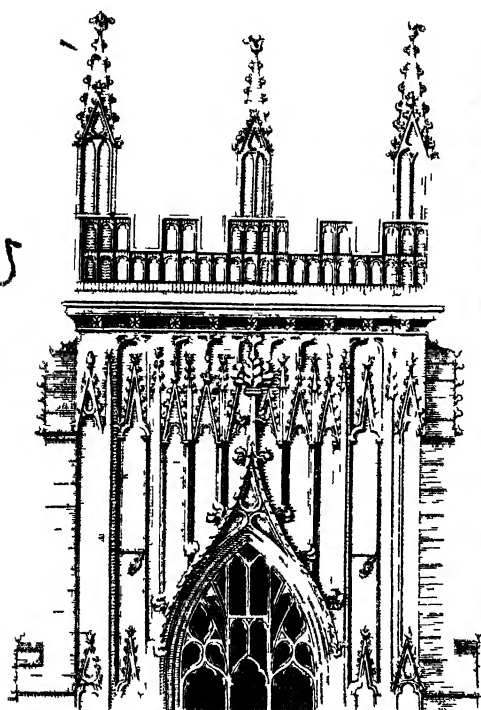






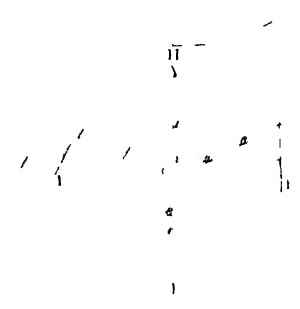
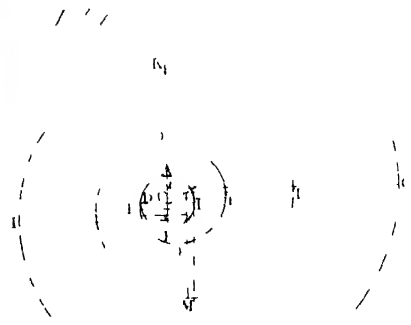
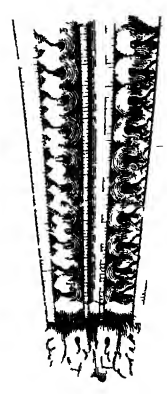
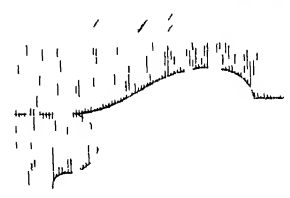
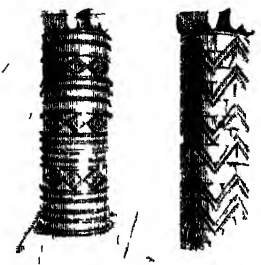
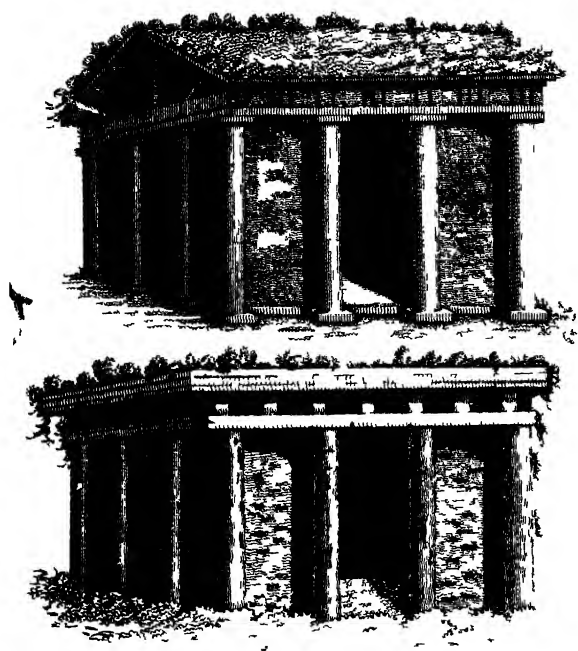


*View of York Minster*



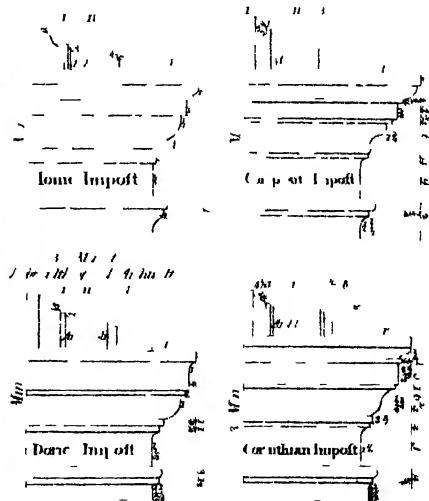
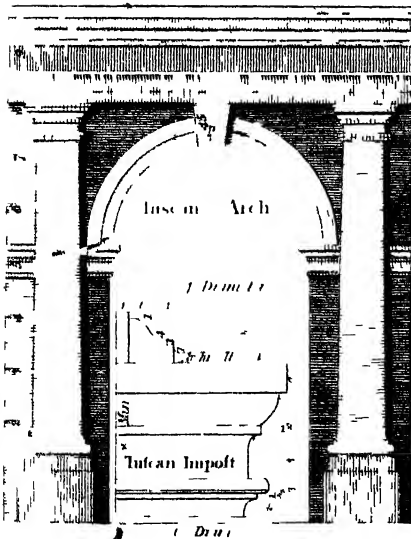
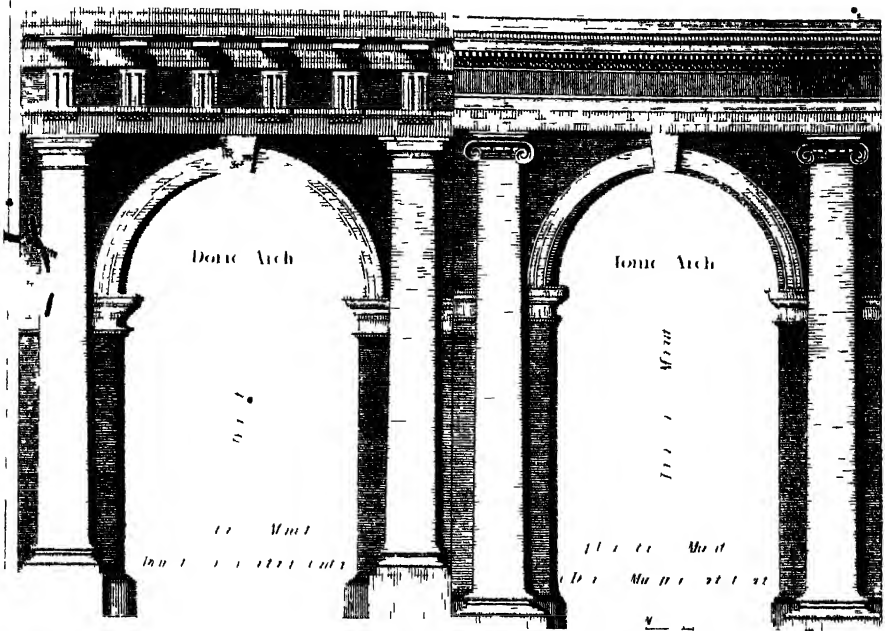


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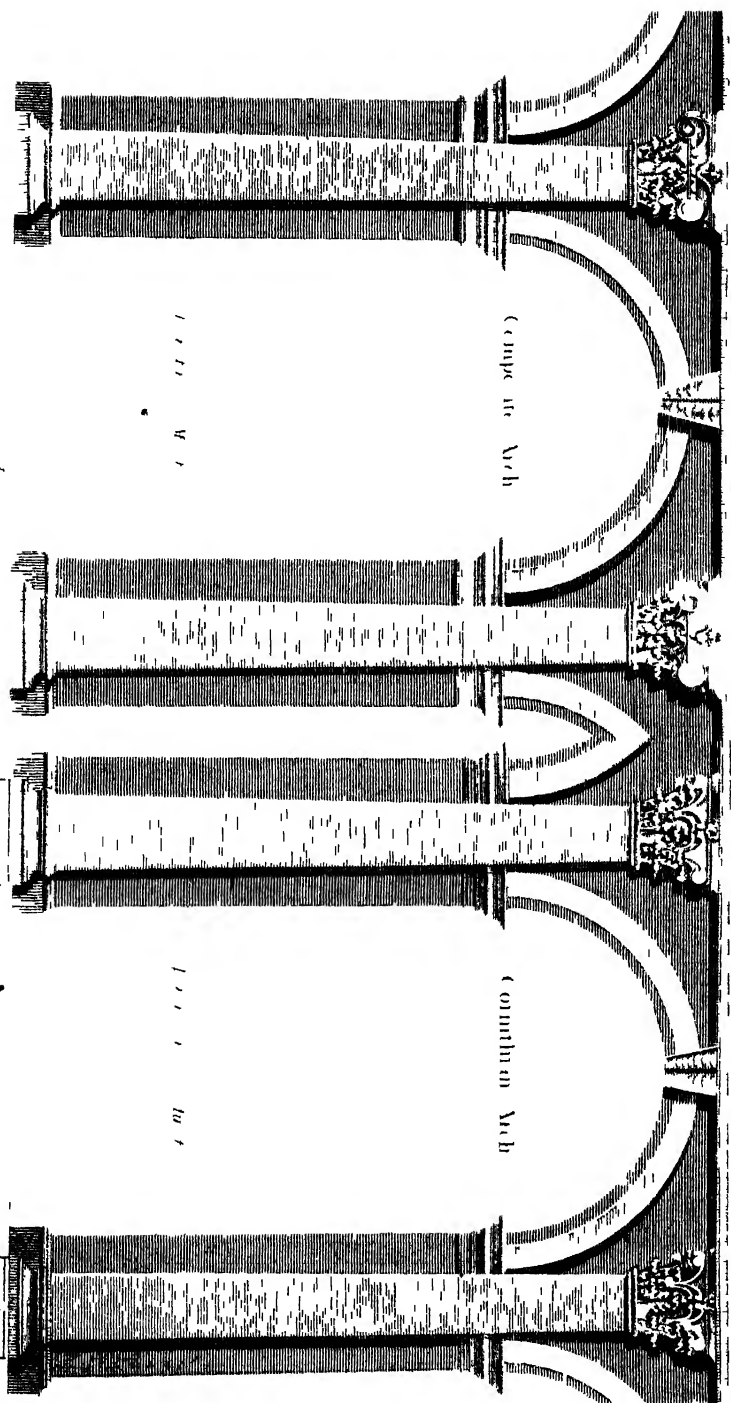












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# ASTRONOMY

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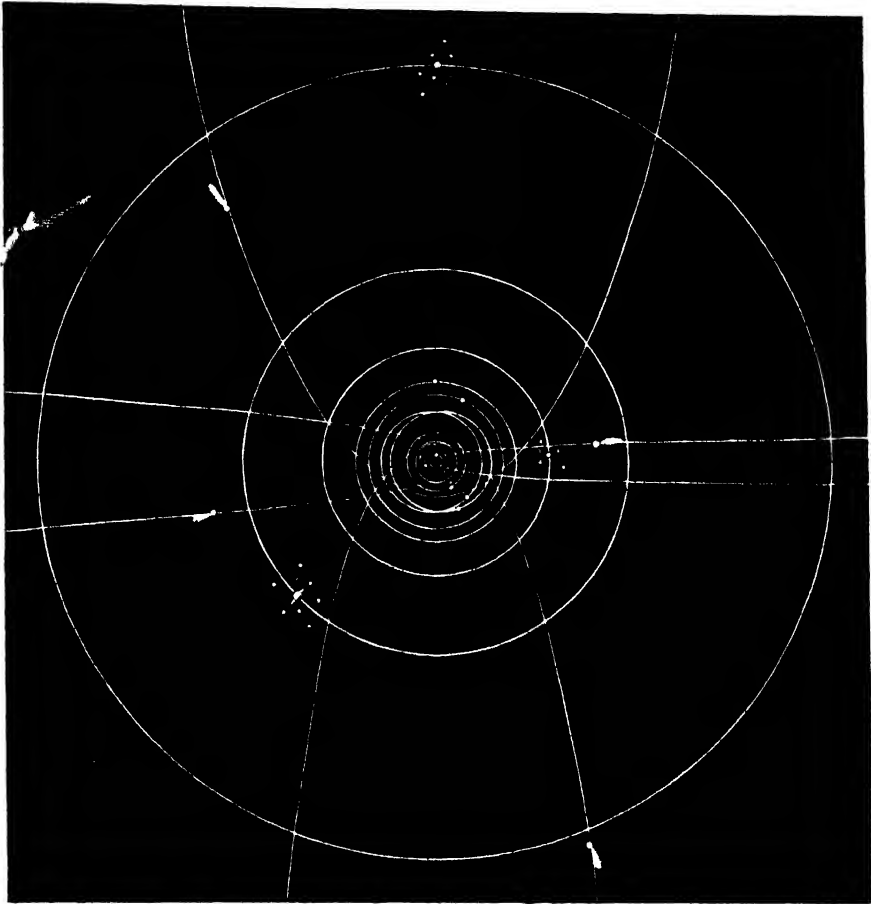




# ASTRONOMY

11-19

## The Solar System



*Physical Magnitude of  
the Planets*

Saturn ♄



Jupiter ♃



Geographical Size of



Mars

Earth

Venus ♀

*Physical Magnitude*

Sun

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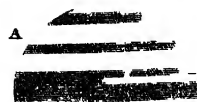
## *The Moon*



*Map as drawn by Herschel*

A B C D

*Jupiter by D.*



*Saturn by D.*

